Think Academy

Jolly Math

Middle School

学而思美国ONLINE

中学数学课程体系

Think Academy 中学长期班体系专为美国G6-G9的初中生打造，提供专业、系统且全面的全年数学课程。课程依据北美学生的学习特点与需求，分为Core+体系（校内同步），Honors体系（超前升学），Challenge体系和Competition体系。

Core+体系（校内同步体系）：通过预习并巩固重点知识，精准练习，实现校内同年进度数学轻松拿A的目标。

Honors体系（超前升学体系）：超前中学正常进度1年，匹配公校最快班进度，并加深学习难度，实现进入公校最快班，高中毕业前修完5门理科AP，SAT/ACT数学满分的目标

Challenge体系：超前中学正常进度2年，在Honors班的基础上继续加快进度，实现两年学完Algebra 1，Geometry和Algebra 2的目标，进度和深度匹配顶尖私校，高中毕业前修完8门理科AP，达到SAT/ACT数学满分的目标。

Competition体系：中学AMC竞赛体系，专门针对AMC考纲设计，通过超纲匹配竞赛考点的体系，培养过上百名获奖选手的专业教练团队授课，帮助中学孩子在G8/9前晋级AIME。

	Year 1			Year 2			Year 3			Year 4			Year 5		
	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring	Summer	Fall	Spring
Core+	Math 6/7a			Math 7b/8			Algebra 1			Geometry			Algebra 2		
Honors	Pre-Algebra			Algebra 1			Geometry			Algebra 2/ Trigonometry			Pre-Calculus		
Challenge	Pre-Algebra+			Algebra 1		Intro to Geo	Geometry		Algebra 2	Trig		Pre-Calculus	AP Calculus		
Competition				AMC 8 HR		AMC 10 Introduction			AMC 10 AIME qualify			AMC 12+ AIME			

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中学竞赛体系学员成绩

2022-2024 AMC8累计获奖学员人数：

456	397	134
Achievement Roll（低年级成就奖）	Honor Roll（全国Top 5%）	DHR（全国Top 1%）

2022-2024 AMC10累计获奖学员人数：

304	187	45
AIME晋级（全国Top 7%）	Honor Roll（全国Top 5%）	DHR（全国Top 1%）

2024 Think全球IMO获奖人数

7金 1银

金牌总数居全球第一

International Mathematical Olympiad
Foundation Bronze Sponsor

Think Academy是国际数学奥林匹克竞赛官方合作伙伴

Think竞赛课程为什么能培养上千位获奖学员?

1 专业竞赛体系，一站式解决竞赛学习

Think Competition根据美国数学竞赛AMC的考纲设计，贴合学生的考试节奏，在**5-6年级学习AMC8**，**7-8年级学习AMC10**，知识点涵盖竞赛的四大模块：代数，数论，数论，和计数概率，从而每年实现一个竞赛目标，最终帮助中学生**在进入高中前完成AMC10的学习，顺利晋级AIME**。

2 优秀竞赛师资，为好成绩保驾护航

Think Competition课程均由**多年竞赛授课经验**的老师授课，让孩子可以更高效且轻松的掌握复杂竞赛知识点。

James老师
宾大-5年竞赛教龄

Dennis老师
杜克大学-4年竞赛教龄

Yichen老师
哥大-4年竞赛教龄

3 和优秀的同龄人一起学习，共同进步

竞赛体系每年的课程均设置入学考试，确保每位学生可以和水平相近的同龄人一起学习，让竞赛备考不再孤单，孩子们可以互相激励，共同进步。

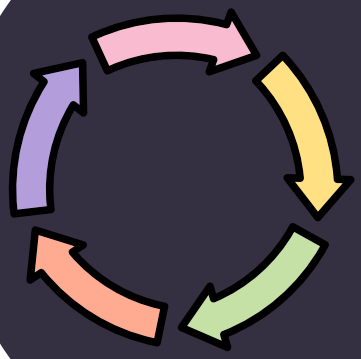
Think Academy US Online

课程亮点

家长省心，规划清晰

授课老师为孩子定制学习规划，全程跟踪学习进度

- **报名课程：**学习规划老师针对孩子的学习能力与目标，**制定个性化学习方案**。
- **上课期间：**每月和家长**反馈孩子的学习情况**，提供有针对性的学习建议，并**监督落实孩子的提升方案**。
- **期中/期末：**每学期组织**家长会**，梳理孩子的学习优势和薄弱环节，并制定新学期的学习规划。



每周学习闭环，保障学习效果

- **课前预习：**15分钟**课前预习题**，温故而知新
- **课后作业：**每节课**配套作业**题目，老师主动和家长反馈学生的作业完成情况。
- **Office Hour：****免费作业讲解直播课**，解答孩子课后不明白的题目与知识点。
- **作业解析：**每道作业配套**讲解视频**，随时复习错题

全年学习服务支持

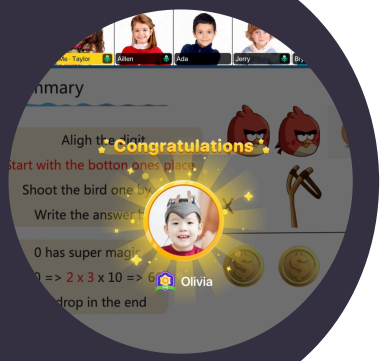
- 专业客服，**全年 364 天 Parent APP 在线支持**，快速响应任何问题
- Parents App**直接和授课老师联系**，沟通更高效，随时掌握孩子的学情表现。
- 在线作业答疑，给孩子**最及时的学习帮助**

课程亮点

孩子开心，学习更高效

精心打磨课堂设计，让孩子爱上数学

- **互动游戏+情景化教学**，让数学课堂不再枯燥
- **金币激励**，孩子可以用金币兑换实体或虚拟奖品，给孩子更及时的正反馈，让孩子更主动地完成学习任务和目标。



自研上课App，强化线上课程体验

- Think Academy**自主研发的上课App**，给孩子带来更丰富的课上互动，包括举手上台，投票作答，选择填空，集体讨论等互动形式，保障**每3分钟一次互动**的频率，提升孩子的上课投入。
- 老师**实时观察每位孩子**的上课情况，保障孩子的学习体验与效果。

成就感带来底层学习动力

- 不仅课上学习高效，课后也有**完善的辅导答疑服务**。课后作业有视频解析，每周还有免费office hour解答孩子的问题，保障每节课都能学懂。
- 孩子在校内达到**成绩和进度双领先**。更愿意投入时间和精力在理科学习上，增强孩子的学习动力，自推成为**理科学霸**。

Contents

Basic Math

Numbers and Operations

Prime Factorizations

1 Find the prime factorization of the following numbers.

① 126 = _____ ② 280 = _____

③ 567 = _____

2 Find the prime factorization of the following numbers.

① 80 = _____ ② 784 = _____

③ 560 = _____ ④ 200 = _____

3 Find the prime factorization of the following numbers.

① 52 = _____ ② 120 = _____

③ 539 = _____

4 Find the prime factorization of the following numbers.

① 30 = _____ ② 720 = _____

③ 240 = _____ ④ 196 = _____

5 Find the prime factorization of the following numbers.

① 72 = _____ ② 169 = _____

③ 369 = _____

6 Find the prime factorizations of the following numbers.

(1) 712 (2) 680

(3) 1024

7 Find the prime factorizations of the following numbers.

(1) 121

(2) 255

(3) 625

Greatest Common Factor and Least Common Multiple

1 Find the greatest common factor of each pair of numbers below.

(1) 12, 30

(2) 24, 8

(3) 144, 108

2 Find the least common multiple of each pair of numbers below.

(1) 15, 25.

(2) 48, 64.

(3) 126, 81.

(4) 88, 847.

3 Find the greatest common factor of each pair of numbers below.

(1) 99, 100.

(2) 42, 84.

(3) 48, 60.

4 Find the greatest common factor of each pair of numbers below.

(1) 97, 193.

(2) 36, 72.

(3) 27, 84.

5 Find the least common multiple of each pair of numbers below.

(1) 5, 7

(2) 3, 9

(3) 15, 20

(4) 24, 36

6 Find the least common multiple of each pair of numbers below.

(1) 26, 17.

(2) 36, 64.

(3) 120, 80.

(4) 77, 121.

Percents, Decimals and Fractions

1 Calculate:

(1) $0 \times 2\frac{1}{3} =$ _____

(2) $2\frac{1}{3} \times 3\frac{3}{4} =$ _____

(3) $1\frac{1}{5} \times \frac{5}{6} =$ _____

2 What is a reasonable estimation for the value of $(91 \times 146)/29$?

A. between 100 and 200
B. between 200 and 300
C. between 300 and 400
D. between 400 and 500

3 Write the following percents as fractions in simplest form.

(1) $122\% =$ _____ .

(2) $64\% =$ _____ .

(3) $400\% =$ _____ .

4 Calculate:

$$\frac{5}{8} - \frac{7}{12} = \text{\_\_\_\_\_}$$

5 Calculate:

(1) $\frac{1}{4} \div \frac{1}{8} =$ _____

(2) $\frac{5}{18} \div \frac{5}{18} =$ _____

(3) $\frac{4}{5} \div \frac{3}{8} =$ _____

6 Calculate:

(1) $\frac{5}{7} + \frac{1}{3} =$ _____

(2) $\frac{5}{9} - \frac{2}{5} =$ _____

7 Calculate:

$1\frac{2}{5} \times 1\frac{5}{11} \times \frac{5}{21} \times \frac{22}{8} =$ _____

8 Which is the largest fraction: _____ .

A. 3/7 B. 3/8 C. 3/9 D. 3/10

9 Calculate:

$\frac{7}{12} - \frac{4}{15} =$ _____

10 Calculate:

(1) $\frac{1}{9} + \frac{7}{9} =$ _____

(2) $1 - \frac{5}{8} =$ _____

(3) $\frac{3}{10} + \frac{7}{10} =$ _____

11 Write the following percents as fractions in simplest form.

(1) $300\% =$ _____ .

(2) $720\% =$ _____ .

(3) $18\% =$ _____ .

12 Calculate:

(1) $33 \div \frac{3}{5} =$ _____

(2) $\frac{6}{7} \div 6 =$ _____

(3) $14 \div \frac{28}{31} =$ _____

13 Calculate:

(1) $\frac{11}{12} - \frac{3}{8} =$ _____

(2) $\frac{4}{15} + \frac{5}{6} =$ _____

14 Calculate:

(1) $\frac{3}{5} \times \frac{5}{8} =$ _____

(2) $\frac{39}{82} \times \frac{82}{39} =$ _____

(3) $\frac{3}{4} \times \frac{4}{9} =$ _____

15 Calculate:

(1) $\frac{2}{11} + \frac{5}{11} =$ _____

(2) $\frac{5}{16} - \frac{3}{16} =$ _____

16 Calculate:

(1) $\frac{3}{28} \times 18 =$ _____

(2) $\frac{7}{9} \times 6 =$ _____

(3) $88 \times \frac{9}{11} =$ _____

(4) $\frac{5}{7} \times 42 =$ _____

17 Calculate:

(1) $\frac{3}{8} - \frac{1}{4} =$ _____

(2) $\frac{1}{7} + \frac{5}{14} =$ _____

(3) $\frac{3}{2} - \frac{7}{10} =$ _____

18 Calculate:

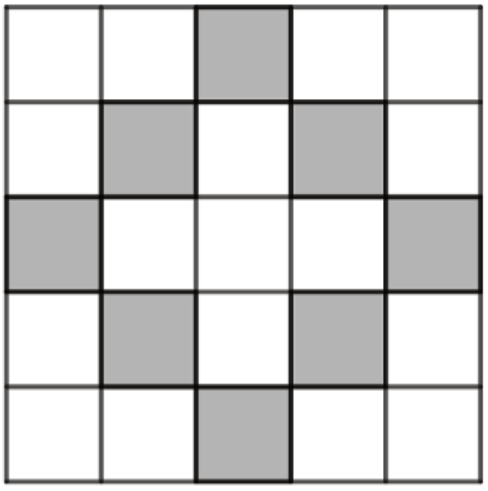
(1) $\frac{1}{4} \times 3 =$ _____

(2) $\frac{2}{15} \times 7 =$ _____

(3) $4 \times \frac{7}{15} =$ _____

(4) $\frac{2}{3} \times 4 =$ _____

19 The largest square shown below is equally divided into small squares. Which fraction of the largest square is shaded?



A. $\frac{6}{25}$ B. $\frac{7}{26}$ C. $\frac{8}{25}$ D. $\frac{9}{25}$

20 Calculate:

(1) $\frac{7}{9} \div \frac{9}{7} =$ _____

(2) $\frac{5}{7} \div \frac{15}{2} =$ _____

(3) $\frac{9}{10} \div \frac{3}{2} =$ _____

21 Which is the smallest fraction?

A. $\frac{2}{3}$ B. $\frac{4}{7}$ C. $\frac{6}{13}$ D. $\frac{8}{16}$

22 Calculate:

(1) $\frac{1}{5} + \frac{2}{5} =$ _____

(2) $\frac{2}{9} + \frac{4}{9} =$ _____

23 Calculate:

(1) $\frac{1}{7} + \frac{1}{3} =$ _____

(2) $\frac{1}{5} + \frac{3}{4} =$ _____

(3) $\frac{6}{7} + \frac{1}{6} =$ _____

(4) $\frac{9}{11} - \frac{2}{3} =$ _____

24 Which of the following numbers is divisible by both 2 and 3 without a remainder?

A. 371 B. 732 C. 241 D. 332

25 Calculate:

(1) $\frac{1}{6} + \frac{3}{8} =$ _____

(2) $\frac{4}{9} + \frac{5}{12} =$ _____

(3) $\frac{5}{8} - \frac{1}{12} =$ _____

(4) $\frac{5}{12} - \frac{3}{16} =$ _____

26 Calculate:

(1) $6\frac{3}{8} + 5\frac{1}{8} =$ _____

(2) $3\frac{3}{4} + 9\frac{3}{4} =$ _____

27 Calculate:

(1) $4 \div \frac{4}{5} =$ _____

(2) $\frac{16}{17} \div 8 =$ _____

(3) $\frac{6}{7} \div 6 =$ _____

28 Which of the following properties is represented by $(A \times B) \times C = A \times (B \times C)$?

A. commutative property
B. associative property
C. distributive property
D. identity property

29 Calculate:

(1) $\frac{3}{8} - \frac{1}{6} =$ _____

(2) $\frac{5}{6} + \frac{4}{9} =$ _____

30 Find the reciprocal of each number:

(1) $\frac{17}{8}$ _____

(2) $7\frac{3}{5}$ _____

(3) 0.125 _____

(4) 3.75 _____

31 Calculate:

(1) $\frac{1}{3} \div 3 =$ _____

(2) $20 \div \frac{4}{9} =$ _____

32 Calculate:

(1) $\frac{1}{2} - \frac{1}{3} =$ _____

(2) $\frac{1}{8} + \frac{1}{5} =$ _____

(3) $\frac{2}{3} - \frac{1}{4} =$ _____

33 Calculate:

(1) $\frac{2}{5} + \frac{4}{5} =$ _____

(2) $\frac{3}{7} + \frac{15}{7} =$ _____

(3) $\frac{17}{11} - \frac{8}{11} =$ _____

(4) $\frac{12}{23} - \frac{10}{23} =$ _____

34 Calculate:

(1) $0 \times 1\frac{1}{18} =$ _____

(2) $2\frac{1}{2} \times \frac{2}{5} =$ _____

(3) $1\frac{2}{7} \times 1 =$ _____

35 Calculate:

(1) $\frac{8}{9} - \frac{2}{5} =$ _____

(2) $\frac{5}{8} + \frac{2}{3} =$ _____

36 Write the following percents as fractions in simplest form.

(1) $172\% =$ _____ .

(2) $345\% =$ _____ .

(3) $50\% =$ _____ .

37 Which percent is equivalent to 13/50?

A. 260% B. 26% C. 2.6% D. 0.26%

38 Calculate:

$\frac{1}{6} \times$ _____ $= \frac{7}{13} \times$ _____ $= \frac{17}{13} -$ _____ $=$ _____ $\times 0.3 = 1$

39 Calculate:

$\frac{1}{53} + \frac{2}{53} =$ _____

40 Calculate:

$\frac{3}{8} \times$ _____ $= \frac{5}{4} \times$ _____ $= 17 \times$ _____ $= 0.35 \times$ _____ $= 1$

41 Calculate:

(1) $\frac{3}{4} - \frac{1}{2} =$ _____

(2) $\frac{5}{6} - \frac{2}{3} =$ _____

(3) $\frac{2}{9} + \frac{1}{3} =$ _____

42 Calculate:

(1) $\frac{1}{4} \div 12 =$ _____

(2) $\frac{4}{5} \div 4 =$ _____

43 Calculate:

(1) $\frac{1}{2} - \frac{1}{8} =$ _____

(2) $\frac{1}{2} + \frac{1}{8} =$ _____

44 Calculate:

(1) $\frac{4}{5} + \frac{5}{6} =$ _____

(2) $\frac{7}{6} - \frac{6}{7} =$ _____

45 Calculate:

(1) $\frac{5}{6} - \frac{2}{3} =$ _____

(2) $\frac{3}{8} + \frac{1}{4} =$ _____

(3) $\frac{2}{15} + \frac{3}{5} =$ _____

(4) $\frac{7}{16} - \frac{3}{8} =$ _____

(5) $\frac{8}{15} - \frac{1}{5} =$ _____

(6) $\frac{5}{18} + \frac{1}{6} =$ _____

46 Calculate:

(1) $4\frac{4}{7} + 3 =$ _____

(2) $3\frac{3}{7} - 3 =$ _____

47 Calculate:

(1) $5 \times \frac{3}{7} =$ _____

(2) $\frac{5}{9} \times 6 =$ _____

(3) $100 \times \frac{2}{5} =$ _____

(4) $\frac{7}{4} \times 12 =$ _____

48 Calculate:

(1) $\frac{3}{5} \times \frac{1}{4} =$ _____

(2) $\frac{6}{7} \times \frac{2}{5} =$ _____

(3) $\frac{5}{9} \times \frac{1}{3} =$ _____

(4) $\frac{1}{6} \times \frac{5}{3} =$ _____

49 Calculate:

(1) $\frac{11}{13} - \frac{2}{13} =$ _____

(2) $\frac{17}{32} - \frac{4}{32} =$ _____

50 Calculate:

(1) $\frac{1}{2} \times \frac{1}{3} =$ _____

(2) $\frac{5}{6} \times \frac{1}{2} =$ _____

(3) $\frac{7}{8} \times \frac{1}{4} =$ _____

(4) $\frac{2}{3} \times \frac{2}{5} =$ _____

51 Which is the sum of $2.4 + 4.8$?

A. $6\frac{1}{5}$ B. $6\frac{2}{5}$ C. $7\frac{1}{5}$ D. $7\frac{2}{5}$

52 Calculate:

(1) $\frac{4}{7} \times \frac{3}{4} =$ _____

(2) $\frac{3}{4} \times \frac{1}{2} =$ _____

(3) $\frac{3}{8} \times \frac{4}{9} =$ _____

(4) $\frac{5}{6} \times \frac{5}{6} =$ _____

53 Calculate:

$3\frac{3}{4} \times 1\frac{1}{5} \times \frac{7}{18} =$ _____

54 Find the reciprocal of each number:

(1) 3 _____

(2) $\frac{3}{8}$ _____

(3) $\frac{7}{4}$ _____

(4) 0.4 _____

55 Calculate:

(1) $\frac{4}{5} - \frac{2}{3} =$ _____

(2) $\frac{1}{4} - \frac{1}{9} =$ _____

56 Write the following percents as fractions in simplest form.

(1) $30\% =$ _____ .

(2) $72\% =$ _____ .

(3) $144\% =$ _____ .

57 Calculate:

(1) $\frac{10}{23} \div \frac{10}{23} =$ _____

(2) $\frac{6}{7} \div \frac{9}{14} =$ _____

(3) $\frac{8}{9} \div \frac{2}{3} =$ _____

58 Find the reciprocal of each number:

(1) 1 _____ (2) 12 _____

(3) $\frac{1}{6}$ _____ (4) $\frac{7}{9}$ _____

59 Calculate:

(1) $\frac{3}{20} \div \frac{1}{4} =$ _____ (2) $\frac{5}{11} \div \frac{15}{22} =$ _____

(3) $\frac{14}{15} \div \frac{14}{25} =$ _____

(4) $\frac{4}{5} \div \frac{12}{25} =$ _____

60 Calculate:

(1) $1\frac{4}{5} \div (1\frac{4}{5} \div 1\frac{4}{5}) =$ _____

(2) $1\frac{4}{5} \div 1\frac{4}{5} \div 1\frac{4}{5} =$ _____

61 Calculate:

$5 + 3\frac{3}{4} + 4\frac{2}{5} =$ _____

62 Calculate:

(1) $\frac{3}{7} - \frac{2}{7} =$ _____

(2) $\frac{5}{6} - \frac{1}{6} =$ _____

63 Which fraction is between 1/2 and 9/10?

A. 2/5 B. 4/7 C. 9/19 D. 20/21

64 Calculate:

(1) $\frac{1}{13} \times 39 \times \frac{8}{21} =$ _____

(2) $\frac{8}{5} \times \frac{1}{24} \times 15 =$ _____

(3) $25 \times \frac{2}{23} \times \frac{1}{5} \times 23 =$ _____

65 Calculate:

(1) $\frac{1}{2} + \frac{1}{6} =$ _____

(2) $\frac{1}{3} + \frac{1}{6} =$ _____

(3) $\frac{3}{4} - \frac{3}{8} =$ _____

66 Calculate:

(1) $13\frac{3}{5} - 11\frac{3}{5} =$ _____

(2) $9\frac{5}{8} - 2\frac{3}{8} =$ _____

(3) $15\frac{3}{8} - 7\frac{7}{8} =$ _____

(4) $24\frac{2}{5} - 11\frac{4}{5} =$ _____

67 Calculate:

(1) $1\frac{1}{2} \times \frac{2}{9} =$ _____

(2) $1\frac{3}{8} \times \frac{16}{22} \times 0 =$ _____

(3) $\frac{7}{9} \times \frac{11}{18} \times 1\frac{7}{11} =$ _____

68 Calculate:

(1) $\frac{15}{16} \div 5 =$ _____

(2) $\frac{12}{25} \div 13 =$ _____

(3) $13 \div \frac{4}{5} =$ _____

(4) $13 \div \frac{2}{17} =$ _____

69 Calculate:

(1) $\frac{2}{7} + \frac{5}{7} =$ _____

(2) $1 - \frac{3}{8} =$ _____

70 Calculate:

(1) $\frac{4}{5} \times \frac{5}{4} =$ _____

(2) $\frac{3}{10} \times \frac{2}{3} =$ _____

(3) $\frac{9}{10} \times \frac{5}{9} =$ _____

(4) $\frac{8}{11} \times \frac{3}{8} =$ _____

71 Calculate:

$3\frac{1}{6} + 5\frac{7}{8} =$ _____

72 Write the following percents as fractions in simplest form.

(1) $98\% =$ _____ .

(2) $360\% =$ _____ .

(3) $425\% =$ _____ .

73 Calculate:

(1) $1\frac{2}{7} \times \frac{1}{18} =$ _____

(2) $2\frac{2}{5} \times 4\frac{1}{6} =$ _____

(3) $6\frac{1}{4} \times 4\frac{2}{5} =$ _____

74 Calculate:

(1) $\frac{3}{5} \div 3 =$ _____

(2) $0 \div \frac{5}{12} =$ _____

(3) $\frac{6}{7} \div 2 =$ _____

NOTE

Equations and Functions

Expressions and Equations

1 Write an expression in terms of a for each of the following.
Bowen has a cherries.

(1) The number of cherries left after 12 cherries have been eaten.

(2) The number of cherries that each child gets if Bowen shares all cherries equally among 3 children.

(3) The total number of cherries that Candy has if she has 8 less than twice the cherries that Bowen has.

(4) The number of cherries each child gets if Bowen shares all his cherries and 22 more cherries among 4 children. Evaluate the expression when $a = 26$.

2 If $2x + 11 = 26 + \frac{x}{3}$, what number does x stand for?

A. 6 B. 9 C. 12 D. 15

3 Which expression can be read as "the sum of 7 and the product of a number and 11" if m represents the number?

A. $m - 7 - 11$ B. 11×7m C. $11m - 7$ D. $7 + 11m$

4 $3\,(7 + x) = 5\,(x + 1)$, $x =$ _____ .

5 Which equation can be read as “2 less than 6 times a number is equal to 10 more than the number”? Let m represent the unknown number.

A. $(6 \times m) - 2 = 10 - m$ B. $(6 \times m) + 2 = 10 + m$

C. $(6 \times m) - 2 = 10 + m$ D. $(6 \times m) + 2 = 10 - m$

6 What is the value of x in the math equation $\frac{26}{x} + 11 = 13$

A. 2 B. 13 C. 26 D. 52

7 If the sum of two prime numbers is 43, the difference between the two prime numbers is ( ) .

A. 35 B. 37 C. 39 D. 41

8 If $4 \times (e + 8) = 36$, what number does e stand for?

A. 1 B. 7 C. 17 D. 24

9 If the area of a triangle is 30m², which equation could be used to determine the base of that triangle? ($A=\frac{1}{2}bh$, where A=Area, b=base, and h=height.)

A. $b = \frac{60}{h}$ B. $b = 30 \times \frac{h}{2}$ C. $b = \frac{15}{h}$ D. $b = 15 - h$

10 If $15 + c = 27 - c$, what number does c stand for?

A. 6 B. 7 C. 8 D. 9

Inequalities

1 Use "≥" or "≤" to answer the following questions.

(1) If $a \geqslant b$, then $a + \frac{2}{3}$ _____ $b + \frac{2}{3}$.

(2) If $a \leqslant b$, then $a + 0.\overline{73}$ _____ $b + 0.\overline{73}$.

(3) If $a \geqslant b$, then $a - 0.4$ _____ $b - 0.4$.

(4) If $a \leqslant b$, then $a - 10\frac{8}{9}$ _____ $b - 10\frac{8}{9}$.

2 Use "$\leqslant$" or "$\geqslant$" to answer the following questions.

(1) If $a \leqslant b, c \geqslant 0$, then $a \times c$ _____ $b \times c$.

(2) If $a \geqslant b, c \geqslant 0$, then $a \times c$ _____ $b \times c$.

(3) If $a \leqslant b, c > 0$, then $a \div c$ _____ $b \div c$.

(4) If $a \geqslant b, c > 0$, then $a \div c$ _____ $b \div c$.

3 Use "$\geqslant$" or "$\leqslant$" to answer the following questions.

(1) If $a \geqslant b$, then $a + \frac{3}{4}$ _____ $b + \frac{3}{4}$.

(2) If $a \leqslant b$, then $a + \frac{4}{5}$ _____ $b + \frac{4}{5}$.

(3) If $a \geqslant b$, then $a - \frac{7}{8}$ _____ $b - \frac{7}{8}$.

(4) If $a \leqslant b$, then $a - \frac{4}{7}$ _____ $b - \frac{4}{7}$.

4 Use "<" or ">" to answer the following questions.

(1) If $a < b$, then $(a + 1) \times 5$ _____ $(b + 1) \times 5$.

(2) If $a > b$, then $(a + 1) \times (-3)$ _____ $(b + 1) \times (-3)$.

(3) If $a < b$, then $(a - 1) \div 5$ _____ $(b - 1) \div 5$.

(4) If $a > b$, then $(a - 1) \div (-5)$ _____ $(b - 1) \div (-5)$.

5 Use "<" or ">" to answer the following questions.

(1) If $a < b$, then $a \times \frac{3}{4}$ _____ $b \times \frac{3}{4}$.

(2) If $a > b$, then $a \times (-\frac{2}{3})$ _____ $b \times (-\frac{2}{3})$.

(3) If $a < b$, then $a \div \frac{4}{5}$ _____ $b \div \frac{4}{5}$.

(4) If $a > b$, then $a \div (-\frac{9}{8})$ _____ $b \div (-\frac{9}{8})$.

6 Use "<" or ">" to answer the following questions.

(1) If $a < b, c > 0$, then $a \times c + 8$ _____ $b \times c + 8$.

(2) If $a > b, c > 0$, then $a \times c + 5$ _____ $b \times c + 5$.

(3) If $a < b, c > 0$, then $a \times c - 3$ _____ $b \times c - 3$.

(4) If $a > b, c > 0$, then $a \times c - 4$ _____ $b \times c - 4$.

7 Use "<" or ">" to answer the following questions.

(1) If $a < b, c < 0$, then $a \times c - 10$ _____ $b \times c - 10$.

(2) If $a > b, c < 0$, then $a \times c + \frac{2}{3}$ _____ $b \times c + \frac{2}{3}$.

(3) If $a < b, c < 0$, then $a \times c - \frac{4}{3}$ _____ $b \times c - \frac{4}{3}$.

(4) If $a > b, c < 0$, then $a \times c - 10\frac{4}{5}$ _____ $b \times c - 10\frac{4}{5}$.

8 Use "≥" or "≤" to answer the following questions.

(1) If $a \geqslant b$, then $a + \frac{7}{8}$ _____ $b + \frac{7}{8}$.

(2) If $a \leqslant b$, then $a + \frac{2}{3}$ _____ $b + \frac{2}{3}$.

(3) If $a \geqslant b$, then $a - \frac{11}{12}$ _____ $b - \frac{11}{12}$.

(4) If $a \leqslant b$, then $a - \frac{5}{7}$ _____ $b - \frac{5}{7}$.

9 Use "<" or ">" to answer the following questions.

(1) If $a < b$, then $(a + 11) \times 28$ _____ $(b + 11) \times 28$.

(2) If $a > b$, then $(a + 15) \times (-4)$ _____ $(b + 15) \times (-4)$.

(3) If $a < b$, then $(a - 7) \div 4$ _____ $(b - 7) \div 4$.

(4) If $a > b$, then $(a - 11) \div (-4)$ _____ $(b - 11) \div (-4)$.

10 Use "<" or ">" to answer the following questions.

(1) If $a < b$, then $a \times \frac{1}{10}$ _____ $b \times \frac{1}{10}$.

(2) If $a > b$, then $a \times (-\frac{7}{8})$ _____ $b \times (-\frac{7}{8})$.

(3) If $a < b$, then $a \div \frac{11}{12}$ _____ $b \div \frac{11}{12}$.

(4) If $a > b$, then $a \div (-\frac{9}{10})$ _____ $b \div (-\frac{9}{10})$.

11 Use "<" or ">" to answer the following questions.

(1) If $a < b, c > 0$, then $a \div c + 19$ _____ $b \times c + 19$.

(2) If $a > b, c > 0$, then $a \times c + 100$ _____ $b \times c + 100$.

(3) If $a < b, c > 0$, then $a \div c - 100$ _____ $b \times c - 100$.

(4) If $a > b, c > 0$, then $a \times c - 2$ _____ $b \times c - 2$.

12 Use "<" or ">" to answer the following questions.

(1) If $a < b, c < 0$, then $a \div c - 100$ _____ $b \div c - 100$.

(2) If $a > b, c < 0$, then $a \times c + \frac{1}{10}$ _____ $b \times c + \frac{1}{10}$.

(3) If $a < b, c < 0$, then $a \div c - \frac{11}{12}$ _____ $b \div c - \frac{11}{12}$.

(4) If $a > b, c < 0$, then $a \times c - 100\frac{4}{5}$ _____ $b \times c - 100\frac{4}{5}$.

Ratios and Rates

1 Every year, there are approximately 12 births per 1,000 people in the United States. If a certain city has a population of 60,000, how many births can they expect in one year?

A. 72 B. 720 C. 1440 D. 7200

2 Answer the questions.

(1) $A : B = 1 : 9$, $B : C = 9 : 19$, $A : B : C =$ _____ .

(2) $A : B = 7 : 9$, $B : C = 18 : 13$, $A : B : C =$ _____ .

(3) $A : B = 3 : 10$, $B : C = 15 : 11$, $A : B : C =$ _____ .

(4) $A : B = 15 : 8$, $B : C = 12 : 19$, $A : B : C =$ _____ .

3 Answer the questions.

(1) $A : B = 4 : 5$, $B : C = 5 : 9$, $A : B : C =$ _____ .

(2) $A : B = 4 : 13$, $B : C = 26 : 23$, $A : B : C =$ _____ .

(3) $A : B = 24 : 45$, $B : C = 9 : 5$, $A : B : C =$ _____ .

(4) $A : B = 5 : 3$, $B : C = 5 : 7$, $A : B : C =$ _____ .

4 Answer the questions.

(1) $A : B = 7 : 13$, $B : C = 13 : 37$, $A : B : C =$ _____ .

(2) $A : B = 5 : 13$, $B : C = 26 : 5$, $A : B : C =$ _____ .

(3) $A : B = 5 : 6$, $B : C = 10 : 3$, $A : B : C =$ _____ .

(4) $A : B = 15 : 14$, $B : C = 21 : 17$, $A : B : C =$ _____ .

5 Answer the questions.

(1) $A : B = 21 : 19$, $B : C = 19 : 37$, $A : B : C =$ _____ .

(2) $A : B = 9 : 17$, $B : C = 34 : 7$, $A : B : C =$ _____ .

(3) $A : B = 5 : 8$, $B : C = 12 : 11$, $A : B : C =$ _____ .

(4) $A : B = 16 : 28$, $B : C = 21 : 11$, $A : B : C =$ _____ .

6 Answer the questions.

(1) $A : B = 13 : 5, B : C = 5 : 13, A : B : C =$ _____ .

(2) $A : B = 1 : 7, B : C = 21 : 8, A : B : C =$ _____ .

(3) $A : B = 2 : 7, B : C = 2 : 7, A : B : C =$ _____ .

(4) $A : B = 3 : 10, B : C = 15 : 11, A : B : C =$ _____ .

7 The total combined price of a basketball, a rope and a skateboard is $32. If the price of the basketball is three times as the price of the rope, and the skateboard costs as much as 4 ropes. How much does a rope cost?

A. 2 B. 4 C. 6 D. 8

8 Answer the questions.

(1) $A : B = 11 : 29$, $B : C = 29 : 7$, $A : B : C =$ _____ .

(2) $A : B = 4 : 11$, $B : C = 22 : 9$, $A : B : C =$ _____ .

(3) $A : B = 4 : 15$, $B : C = 20 : 3$, $A : B : C =$ _____ .

(4) $A : B = 3 : 4$, $B : C = 5 : 9$, $A : B : C =$ _____ .

9 Answer the questions.

(1) $A : B = 3 : 7$, $B : C = 7 : 13$, $A : B : C =$ _____ .

(2) $A : B = 9 : 14$, $B : C = 28 : 37$, $A : B : C =$ _____ .

(3) $A : B = 17 : 21$, $B : C = 7 : 16$, $A : B : C =$ _____ .

(4) $A : B = 9 : 7$, $B : C = 9 : 13$, $A : B : C =$ _____ .

10 Answer the questions.

(1) $A : B = 17 : 19$, $B : C = 19 : 47$, $A : B : C =$ _____ .

(2) $A : B = 2 : 9$, $B : C = 18 : 13$, $A : B : C =$ _____ .

(3) $A : B = 9 : 10$, $B : C = 15 : 13$, $A : B : C =$ _____ .

(4) $A : B = 23 : 4$, $B : C = 7 : 13$, $A : B : C =$ _____ .

11 Jim is an American who is travelling to Thailand, where the currency is called "Baht". If one American dollar is worth 31 Baht, how many Baht can Jim get for 3.50?

A. 108 B. 108.5 C. 109 D. 109.5

12 Answer the questions.

(1) $A : B = 45 : 46$, $B : C = 46 : 47$, $A : B : C =$ _____ .

(2) $A : B = 1 : 8$, $B : C = 16 : 13$, $A : B : C =$ _____ .

(3) $A : B = 7 : 12$, $B : C = 21 : 4$, $A : B : C =$ _____ .

(4) $A : B = 5 : 4$, $B : C = 9 : 13$, $A : B : C =$ _____ .

13 Answer the questions.

(1) $A : B = 15 : 37$, $B : C = 37 : 13$, $A : B : C =$ _____ .

(2) $A : B = 4 : 13$, $B : C = 26 : 17$, $A : B : C =$ _____ .

(3) $A : B = 7 : 6$, $B : C = 9 : 13$, $A : B : C =$ _____ .

(4) $A : B = 13 : 11$, $B : C = 17 : 31$, $A : B : C =$ _____ .

14 Answer the questions.

(1) $A : B = 1 : 5, B : C = 5 : 6, A : B : C =$ _____ .

(2) $A : B = 1 : 3, B : C = 6 : 7, A : B : C =$ _____ .

(3) $A : B = 1 : 3, B : C = 4 : 5, A : B : C =$ _____ .

(4) $A : B = 3 : 4, B : C = 6 : 13, A : B : C =$ _____ .

15 Jack drives 30 miles per hour. How many miles will he drive in 150 minutes?

A. 30 B. 60 C. 75 D. 120

16 The total combined weight of a book,a bottle, and a pencil case is 14 grams. If one book weighs as much as 2 bottles and a pencil case weighs as much as 4 bottles, how many grams does a bottle weigh?

A. 2 grams B. 4 grams C. 6 grams D. 8 grams

17 Answer the questions.

(1) $A : B = 1 : 13, B : C = 13 : 27, A : B : C =$ _____ .

(2) $A : B = 9 : 13, B : C = 26 : 47, A : B : C =$ _____ .

(3) $A : B = 3 : 14, B : C = 21 : 8, A : B : C =$ _____ .

(4) $A : B = 5 : 2, B : C = 18 : 19, A : B : C =$ _____ .

18 Answer the questions.

(1) $A : B = 3 : 5$, $B : C = 5 : 11$, $A : B : C =$ _____ .

(2) $A : B = 5 : 12$, $B : C = 24 : 19$, $A : B : C =$ _____ .

(3) $A : B = 3 : 4$, $B : C = 1 : 7$, $A : B : C =$ _____ .

(4) $A : B = 7 : 6$, $B : C = 9 : 7$, $A : B : C =$ _____ .

Proportion

1 Solve the equations.

(1) $x : 9 = 4 : 12$

(2) $x : \frac{1}{6} = \frac{1}{4} : \frac{3}{4}$

2 Solve the equations.

(1) $(1 + x) : (7 + x) = 3 : 5$

(2) $(2y - 1) : 4 = (5 + y) : 8$

3 Solve the equation.

$(5x - 7) : 4 = 2x : 3$

4 Solve the equations.

$8 : x = 1 : 2000$

5 Solve the equation.

$\frac{7}{5} : 3.5x = \frac{4}{3} : 4$

6 Solve the equations.

(1) $(x + 3) : (x + 1) = 3 : 2$

(2) $(x + 1) : x = 8 : 7$

(3) $(x - 3) : (x + 1) = 2 : 6$

7 Solve the equations.

(1) $\frac{18}{x} = \frac{3}{10} : \frac{3}{15}$

(2) $1.2 : x = \frac{4}{5}$

8 Solve the equations.

(1) $4 : x = 64 : 48$

(2) $2 : 4 = x : 3.5$

(3) $\frac{4}{5} : x = 3 : \frac{5}{3}$

(4) $4 : 7 = x : \frac{21}{4}$

9 Solve the equations.

(1) $\frac{2}{3} : \frac{5}{6} = x : 9$

(2) $4 : \frac{7}{6} = x : 5.25$

10 Solve the equations.

(1) $2 : 5 = 14 : x$

(2) $1 : x = 96 : 16$

11 Solve the equations.

(1) $3\frac{1}{2} : (x + 3) = \frac{1}{6} : 2$

(2) $7 : (x + 3) = 8 : (2x - 6)$

12 Solve the equation.

$(4x + 3) : 3 = (10x - 2) : 6$

13 Solve the equations.

(1) $\frac{6}{x+2} = \frac{5}{x}$

(2) $(7x - 10) : (3x + 5) = \frac{5}{4}$

14 Solve the equations.

(1) $5 : x = 3\frac{3}{4} : 6$

(2) $\frac{2}{7} : x = 2\frac{2}{5} : 3$

15 Solve the equations.

(1) $4 : x = 25 : 6$

(2) $\frac{x}{4} = 3 : 16$

16 Solve the equations.

(1) $48 : 5 = x : \frac{1}{8}$

(2) $4 : \frac{2}{3} = \frac{x}{25}$

17 Solve the equations.

(1) $\frac{4}{5} : x = 2 : \frac{5}{3}$

(2) $4 : 7 = x : 5.25$

18 Solve the equations.

(1) $\frac{4}{5} : x = 8 : 15$

(2) $x : \frac{2}{3} = \frac{1}{5} : \frac{4}{3}$

19 Solve the equations.

(1) $x : 25 = 12 : 5$

(2) $4 : \frac{2}{3} = x : 2$

(3) $6 : x = 3 : 5$

20 Solve the equations.

(1) $\frac{7}{x+3} = \frac{8}{2x-6}$

(2) $\frac{8}{x+3} = \frac{6}{x}$

21 Solve the equation.

$1 : 0.4 = 1.35 : x$

Functions

1 Use the table to answer the following question.

Input	Output
3	9
5	13
6	15
8	19
11	y

What is the value of y?

A. 25 B. 27 C. 29 D. 31

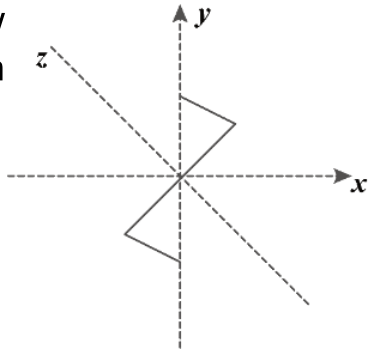
2 Use the table to determine the rule.

Input x	Output y
3	4
5	8
11	20
13	24

What is the rule for the function?

A. $y = x + 1$ B. $y = 2x - 2$ C. $y = x + 9$ D. $y = 3x - 15$

3 The figure shown may be folded along one or more of the dotted lines. Which line or pair of lines, when folded, will allow the pattern '>' shown on the right to exactly match the original figure '<' shown on the left?

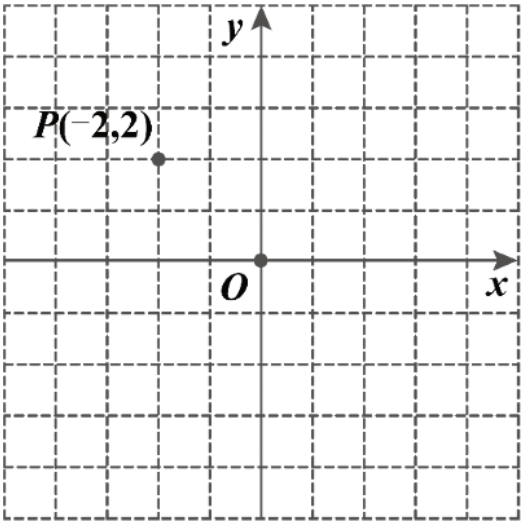


A. Line z only
B. Line x only
C. Line z and line y
D. Line y and line x

4 Olivia plotted points $P(2,2)$, $Q(3,5)$, $R(7,5)$, $S(8,2)$ on a coordinate grid. If a polygon is formed by connecting sides PQ, QR, RS, SP, which type of polygon is formed?

A. Square B. Trapezoid C. Rectangle D. Parallelogram

5 If the point P was shifted 2 units up and 4 units to the right, what would be its new coordinates?



A. (2,4) B. (-2,2) C. (-2,4) D. (2,-4)

6 Use the table to determine the rule.

Input Δ	Output □
7	2
16	5
22	7
34	11

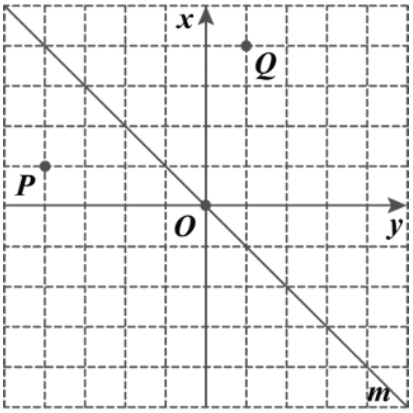
What is the rule for the function?

A. $\triangle = \square + 5$ B. $\triangle = 4\square - 6$ C. $\triangle = \square + 23$ D. $\triangle = 3\square + 1$

7 Tom plotted points $A(1,2)$, $B(6,2)$, $C(6,5)$, $D(1,5)$ on a coordinate grid. If a polygon is formed by connecting sides AB, BC, CD, DA, which type of polygon is formed ?

A. Rectangle B. Rhombus C. Square D. Trapezoid

8 Use the grid below to answer the question.



Which line or pair of lines could point P be folded over in order to end up exactly where point Q is ?

A. Line m only
B. Line x only
C. Line m and line x
D. Line x and line y

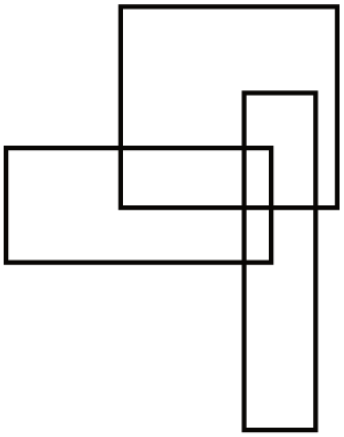
NOTE

NOTE

Geometry

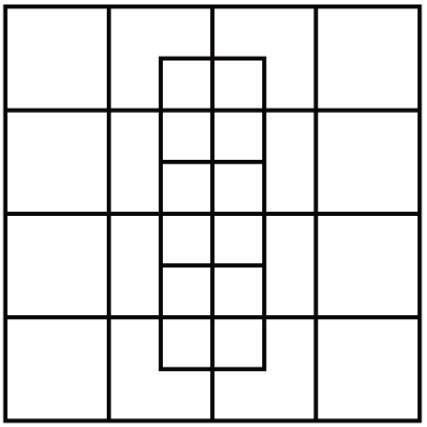
Geometry Objects

1 How many rectangles are in this figure?



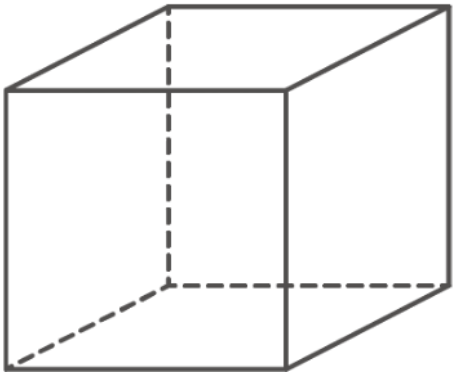
A. 8 B. 9 C. 10 D. 11

2 How many squares are there in the figure to the right?



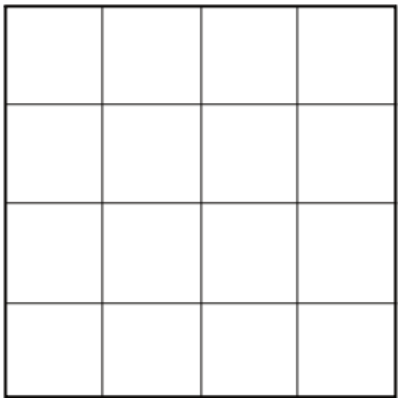
A. 46 B. 47 C. 45 D. 37

3 Use the figure to answer the question.
How many edges does the cube have?



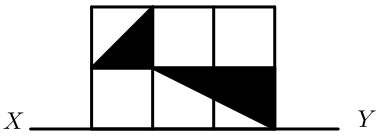
A. 4 B. 6 C. 8 D. 12

4 Use the figure to answer the question
How many squares can be found in the figure below?

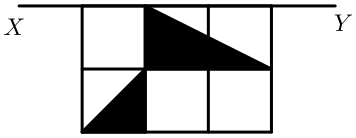


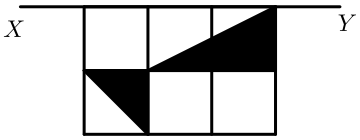
A. 16 B. 25 C. 29 D. 30

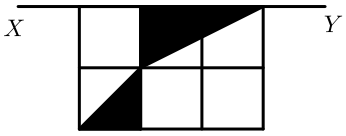
5 The figure below shows the top half of a symmetric figure. XY is the line of symmetry.

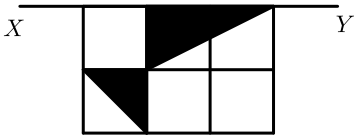


Which one of the following completes the symmetric figure? ( )

A. 

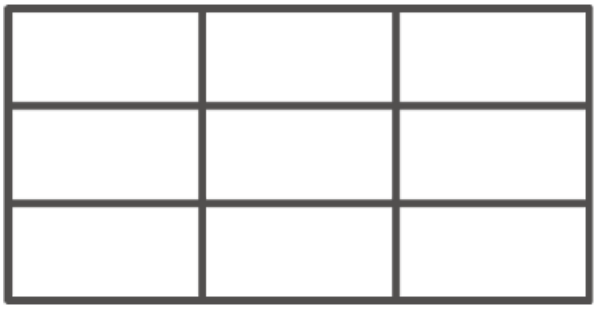
B. 

C. 

D. 

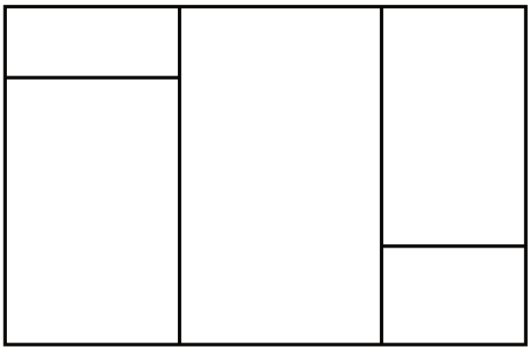
6 Use the figure to answer the question.

How many rectangles in the figure below are similar to the one above?



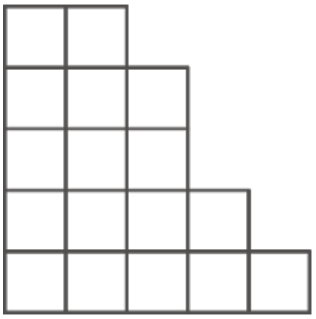
A. 14 B. 16 C. 25 D. 29

7 How many rectangles are there in the picture?

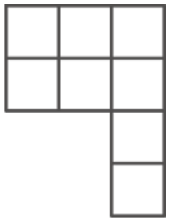


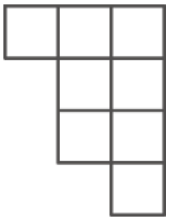
A. 8 B. 9 C. 10 D. 11

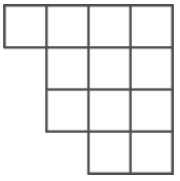
8 Use the diagram to answer the question.

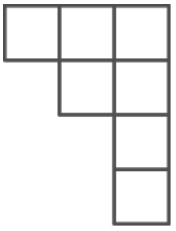


Which piece would complete the diagram to make a square?

A. 

B. 

C. 

D. 

Squares, Rectangles and Triangles

1 A triangle has side lengths of 6, 10 and 11. An equilateral triangle has the same perimeter. What is the side length of the equilateral triangle? ( )

A. 18 B. 11 C. 10 D. 9 E. 6

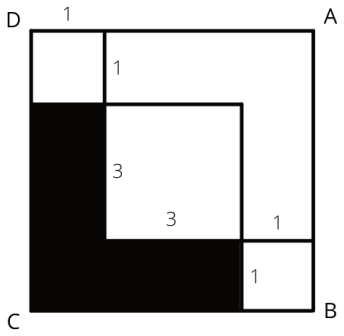
2 One side of a rectangle is 8 cm long, while the other is half as long. A square has the same perimeter as the rectangle. What is the side length of the square?

A. 4 cm B. 6 cm C. 8 cm D. 12 cm

3 James has a wire that is 28 cm long. He uses it to make a rectangular photo frame with a length of 8 cm. What is the area inside the photo frame?

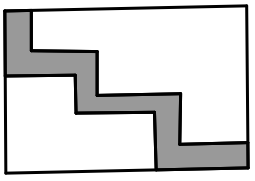
A. 28 B. 36 C. 48 D. 56

4 Figure $ABCD$ is a square. Inside this square, three smaller squares are drawn with the side lengths as labeled. The area of the shaded L-shaped region is _____ .



A. 6 B. 7 C. 8 D. 9

5 As shown in the figure, there is a grass path on a rectangular lawn measuring 40m by 20m. The widths of the grass path are 2m . Find the area of the grass path.

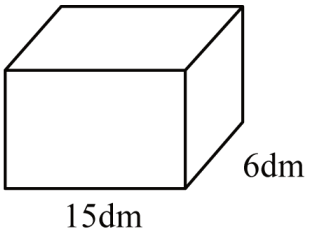


Surface Area and Volume

1 Tom plotted points $A(1,2)$, $B(6,2)$, $C(6,5)$, $D(1,5)$ on a coordinate grid. If a polygon is formed by connecting sides AB, BC, CD, DA, which type of polygon is formed ?

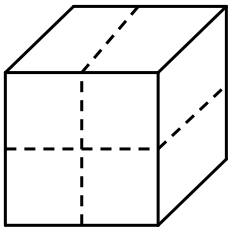
A. Rectangle B. Rhombus C. Square D. Trapezoid

2 A shop has a fish tank in stock. A customer asks about the size of this fish tank. Unfortunately, the description tag only shows the length and the width of the fish tank as the picture shows below. The size of the height is stained. But the staff knows that this fish tank can hold 720 dm^3 of water at most. Can you find the height of the fish tank? (Ignore the thickness of the fish tank.)



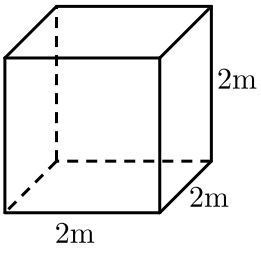
A. $8dm$ B. $10dm$ C. $12dm$ D. $14dm$

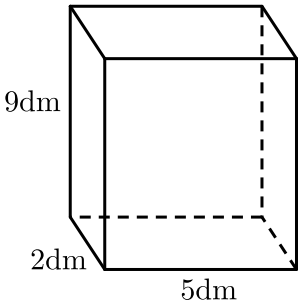
3 As the picture shows below, the cube with an edge length of 9 dm is cut into four cuboids. The total surface area of the four cuboids is _____ dm^2 .



A. 486 B. 648 C. 729 D. 810

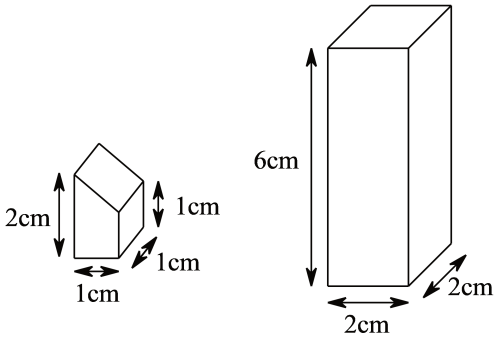
4 The surface areas of the cube and the cuboid below are _____ m^2 and _____ dm^2, respectively.





A. 8, 90 B. 24, 146 C. 24, 73 D. 24, 90

5 Blocks of this shape are packed into the container on the right. What is the greatest number of blocks that can be placed inside the container?



NOTE

Word Problems

Whole Number Word Problems

1 Miss Jones bought 40 flowers. She wanted to make every 3 flowers a bunch for her neighbors. How many bunches of flowers could she make?

A. 13 B. 14 C. 15 D. 16

2 Tina is booking hotel rooms for a family trip in Hawall. She knows how many family members will go, and she knows how many people can live in one hotel room. How could she figure out how many rooms(R) to book at least?

A. R=the number of family members ÷ the number of people a hotel room can hold

B. R=the number of people a hotel room can hold ÷ the number of family members

C. R=the number of hotel rooms ÷ the number of rooms Tina needs

D. R=the number of people the hotel can hold ÷ the number of family members

3 Which story best fits the expression 13×6?

A. Gina sold a total of 13 cars over the last 6 weeks. How many cars did she sell each week?

B. Gina sold 13 cars in January, then she sold 6 more in the next month. How many cars did she sell in all?

C. Ginawants to sell 13 cars in one month.She has sold 6 so far. How many more cars does she need to sell?

D. Gina sells 13 cars every month. How many cars will she sell in 6 months?

4 Judy made 383 cream flowers for cakes. She put 9 cream flowers on each cake. To make the flowers enough for the last cake, how many more cream flowers need to be made?

A. 2 B. 3 C. 4 D. 5

Ratio and Rates Word Problems

1 Addy, Alice and Bill have 150 candies altogether. The ratio of Addy's candies to Alice's candies is $3 : 5$ and the ratio of Alice's candies to Bill's candies is $5 : 2$, how many candies does Bill have?

2 Anne, Lucy and Mike spent 430 for their mother's birthday. The ratio of money Anne and Lucy spent is $5 : 2$; the ratio of money Lucy and Mike spent is $5 : 4$. So how much did the three of them spend respectively ?

3 The candy store has 49 milk candies, the ratio of milk candies to chocolate candies is $7 : 6$, then the candy store has _____ chocolate candies.

4 Bran, Sophia and Simon got paid a total of 240 dollars for mowing neighborhood lawns. They split the money in the ratio of $4 : 11 : 9$. Bran got _____ dollars less than Simon did.

5 Each of Roy, Tom, and Steven has some chocolate bars. The ratio of the number of chocolate bars of Roy to that of Tom is $5 : 9$. The ratio of the number of chocolate bars of Tom to that of Steven is $6 : 7$. Roy has 11 chocolate bars less than Steven does. Tom has _____ chocolate bars.

6 The radio of books library A and library B have is $7 : 5$, if library A gives library B 130 books, the radio becomes $3 : 4$, so how many books does library A have originally?

7 The speeds of boat A and B are in the ratio of $17 : 15$ and the speeds of boat B and C are in the ratio of $3 : 2$. Given that boat A travels 14 more miles per hour than boat C does, boat B travels _____ miles in an hour.

8 There are 40 to 50 students in the classroom, the ratio of boys to girls is $5 : 4$, so how many boys and girls are in this class respectively?

9 Gary, Kevin and Ryan got paid a total of 500 dollars for painting the neighborhood walls. They received their shares of the money in the ratio of $13 : 20 : 17$. Gary got _____ dollars less than Ryan did.

10 Morgan and Kim have a number of jelly beans in a ratio of $5 : 3$. Kim and Mary have a number of jelly beans in a ratio of $6 : 1$. Given that they has 102 jelly beans in total, Morgan has _____ jelly beans.

11 Robert, John, and Richard all have some dimes. The ratio of the number of dimes of Robert to that of John is $5 : 7$. The ratio of the number of dimes of John to that of Richard is $14 : 13$. The dimes of Robert are 6 less than that of Richard. John has _____ dimes.

12 The lengths of stick a and stick b are in the ratio of $2 : 3$ and the length of stick b and stick c are in the ratio of $4 : 7$. Given that stick a is 52 feet shorter than stick c., find the lengths of stick a, b, c, respectively.

13 The speeds of car A and B are in the ratio of $11 : 16$ and the speeds of car B and car C are in the ratio of $8 : 9$. Given that car A runs 28 miles per hour less than car C, car B runs _____ miles in an hour.

Inequalities Word Problems

1 Alan is saving money for a new cell phone which cost 900 dollars. He currently has 300 dollars. If he can save 120 dollars per month, how long does he have to wait in order to save enough money for the cell phone?

2 Ryan has at most 18 dollars in his pocket. He wants to buy a cupcake for 6.5 dollars and spend the rest on chocolate bars. Each chocolate bar costs 2.3 dollars. How many chocolate bars can he buy at most?

3 Alan is saving money for a new laptop which costs 1000 dollars. He currently has 200 dollars. If he can save 160 dollars per month, how long does he have to wait in order to save enough money for the laptop?

4 Nancy is busy with her summer homework. She has already written 10 pages. How many pages does she need to work for if she has to finish 122 pages all together in a week?

5 Joe is running along a 400-meter circular track. How many meters per minute should she run at least in order to run 4 laps in less than 10 minutes?

6 Classroom is on the 7th floor and Aimee is going to have a class there in 12 minutes. If Aimee's speed remains the same and the floors are equidistant from each other, how many floors should she run per minute not to be late?

7 If the sum of three numbers A, B and C is 60, and the ratio of $A : B$ is $3 : 4$, the ratio of $B : C$ is $4 : 5$, then $B =$ _____ .

8 A parking lot charges at an hourly rate of 3.2 dollars. Marica has at most 48 dollars to pay the parking bill. How long can he park in the parking lot?

9 May is now saving money to buy an album, she has already saved 50 dollars, and is going to save 40 dollars per month until she has more than 400 dollars. So after how money months can she buy the album?

10 Sherry is doing part-time babysitting which is paid at an hourly rate of 18 dollars. How many hours does she need to work for if she wants to earn at least 324 dollars in a week?

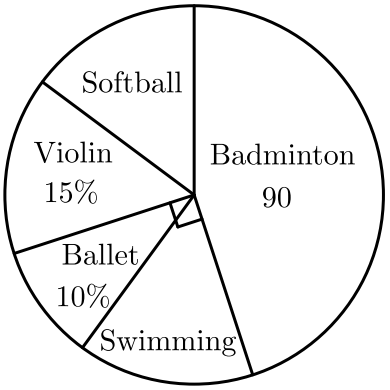
11 One day, in order to measure the height of the school building, Sara and her partner inserted a bamboo pole with a length of 2 m vertically into the ground. The shadow of the bamboo 0.8 m long, and the shadow length of the building was 21.6 meters, so the height of the building is _____ meters.

12 William is taking a part-time job which is paid 18 dollars per hour. How many hours does he need to work for if he wants to earn at least 270 dollars in a week?

Percent Word Problems

1 The fruit shop sold 70 kg of apples yesterday, today they sold 20% less apples. How much did they sell today?

2 Some Year 4 pupils were asked to name their favourite hobbies.
Their choices are represented in the pie chart below.
There was an equal number of pupils who liked swimming and softball.
Find the total number of Year 4 pupils who took part in the survey. ( )



A. 110 B. 120 C. 180 D. 200

3 Mike put 10000 dollars into a savings account for one year. The annual rate of interest on the account was 3%. How much can he withdraw from the account the next year?

4 Mr. Young earns 50000 dollars a year. About 5% is taken out for the rent. How much is left after paying her rent?

5 A teddy bear sells at a price of 45 dollars. April gets a discount of 10% and buys it. How much should April pay?

6 The shop sold a television at 120% of the purchase price. The purchase price is 800 dollars, how much did they earn?

Decimals and Fractions Word Problems

1 Daisy prepared some snacks for her family trip. This is the list of what she has bought.

LIST
4 kilograms of raisins
1 kilogram of chocolate chips
7 kilograms of nuts
5 kilograms of cereal
2 kilograms of dried strawberries

She then mixes the snacks evenly and equally divides them into 4 bags. How many kilograms of food are there in each bag?

A. 4 B. $4\frac{1}{4}$ C. $4\frac{3}{4}$ D. 5

2 The 2019American Gross Domestic Product (GDP) is $21,427,700 million. Which of the following numbers is the closest to $\frac{1}{5}$ of the 2019 American GDP?

A. The GDP of Germany in 2019 is $3,845,530 million.
B. The GDP of Japan in 2019 is $5,081,769 million.
C. The GDP of China in 2019 is $14,342,902 million.
D. The GDP of the European Union in 2019 is $15,592,795 million.

3 Mark bought a plant. It grew 1.89 inches over the first week, then 4.35 inches over the next week. How many inches did Mark's plant grow over the two weeks?

A. 6.24 B. 6.14 C. 5.24 D. 5.14

Expression Word Problems

1 John had $9p$ coins. He spent p coins buying a game and gave $3t$ coins to Peter. Then he gave two-third of the remaining coins to Klaus. Write an algebraic expression to represent the number of coins John left: _____ coins.

2 Siti had $6x$ pears. She ate 7 pear and gave x pears to her neighbours. Siti's brothers then ate one-third of the remaining pears. Write an algebraic expression to represent the number of pears Siti left: _____ pears.

3 Write an expression that can be read as "23 more than the quotient of 5 and a number" if x represents the unknown number: _____ .

4 Write an expression that can be read as "22 more than the product of a number and $\frac{1}{3}$" if x represents the unknown number: _____ .

5 The weight of a pineapple is t kg. The weight of a durian is three times as heavy as the pineapple. The weight of a watermelon is 12kg less than the weight of the durian. Write an algebraic expression to represent the weight of the watermelon: _____ kg

6 The weight of a pineapple is u kg. The weight of a durian is four times as heavy as the pineapple. The weight of a watermelon is 34kg less than the weight of the durian. Write an algebraic expression to represent the weight of the watermelon: _____ kg

7 Write an expression that can be read as "12 less than the quotient of a number and 6" if x represents the unknown number: _____ .

8 (1) Julia is x years old. She will be _____ years old next year.

(2) Luisa is x years old. She was _____ years old seven years ago.

(3) Charles studies math for an hour each day. In x weeks, he would study math for _____ hours in total.

(4) Eilson equally distributes x toys to six of his friends. Each friend would get _____ toys.

(5) James bought x apples and y oranges. One apple costs 1 dollar and one orange costs 2 dollars. Write an algebraic expression to show how much money James spent: _____ .

9 Siti had $9z$ pears. She ate 12 pear and gave z pears to her neighbours. Siti's brothers then ate one-fourth of the remaining pears. Write an algebraic expression to represent the number of pears Siti left: _____ pears.

NOTE

NOTE

Advanced Math

Numbers and Operations

Mix Operations with Fractions and Decimals

1 Calculate:

(1) $0.4 \times (3 + \frac{7}{16}) =$ _____

(2) $\frac{1}{3} \times (0.2 + 0.4 + 0.5) =$ _____

2 Calculate: $\left(\frac{1}{5}\right)^{2018} \times 5^{2019} =$ _____ .

3 Calculate:

(1) $24 \times (\frac{1}{3} - \frac{1}{4} + \frac{5}{6}) =$ _____

(2) $14 \div \frac{1}{2} \times \frac{1}{7} =$ _____

4 Calculate: $\left(-18\frac{4}{5}\right) + \left(+53\frac{3}{5}\right) + (-53.6) + \left(+18\frac{4}{5}\right) + (-100) =$ ( ) .

A. 100　　B. 101　　C. −100　　D. −101

5 Calculate:

(1) $(\frac{1}{2})^2 - 2 \times (\frac{3}{8} - \frac{1}{4}) =$ _____

(2) $-\frac{1}{5} \times 4 + (\frac{4}{3})^2 \div \frac{4}{9} =$ _____

6 Calculate:

$(-1)^3 + \left(8\frac{1}{2}\right) \times \frac{4}{17} + (-3)^3 \div [(-2)^5 + 5] =$ _____ .

7 Calculate:

$-1^2 + \left[\frac{7}{4} + 8 \times (-3)\right] \times 0.5 - (-5)^2$.

8 Calculate:

$\left(\frac{1}{8} + 1\frac{1}{3} - 2.75\right) \times (-24) + (-1)^{2017}$.

9 Calculate:

(1) $(-12) \times (-\frac{2}{3} + \frac{1}{2} + \frac{1}{4}) =$ _____

(2) $(-12) \times (-\frac{1}{5}) \div 5 =$ _____

10 Calculate:

(1) $(-32) \times (-\frac{3}{4} + \frac{1}{6} + \frac{3}{8}) =$ _____

(2) $(-16) \times (-\frac{1}{8}) \div 6 =$ _____

11 Calculate:

(1) $0.2 \times (7 + \frac{3}{8}) =$ _____

(2) $\frac{1}{6} \times (0.4 + 0.3 + 0.6) =$ _____

12 Calculate: $-32\frac{1}{3} + (-3\frac{1}{8}) + (-2\frac{7}{8}) + (-10\frac{2}{3}) =$ ( ) .

A. -49 B. -46 C. -43 D. -40

13 Calculate:

$$1-3\frac{1}{11}\div\frac{4}{3}\times\frac{3}{4}\div\frac{34}{11}$$

Operations with Absolute Values

1 Calculate:

$$-3^2+|-5|-18\times\left(-\frac{1}{3}\right)^2.$$

2 $|-2\times3|-|6\div2|+|-4+1|=$ _____

3 Calculate:

$$\left|-2^2-(-2)^2\right|-\left|(-3)^2\div(-3)^3\right|+\left|-\frac{1}{3}\right|-|4\div 9|-\left|-7^2\right| .$$

4 $|-3\times 4|-|8\div 4|+|-3+2|=$ _____

5 $|5|-|-21|-|4-(9-3)|=$ _____

6 Calculate:

$|1-\sqrt{5}|+|3-\sqrt{5}|-|3.14-\pi|=$ ( ) .

A. $0.86-2\sqrt{5}+\pi$

B. $5.14-\pi$

C. $2\sqrt{5}-7.14+\pi$

D. $-1.14+\pi$

7 $|-4|-|-8|-|3-9|=$ _____

8 $|-7+4|+|3+(-2)|=$ _____

9 Calculate: $\left(-\frac{2}{3}\right)+\left|0-5\frac{1}{6}\right|+\left|-4\frac{5}{6}\right|+\left(-9\frac{1}{3}\right)=$ _____ .

10 $|2\times 3-48\div 6|=$ _____

11 $|3\times 5-21\div 7|=$ _____

12 $|-6|-|-9|-|3-8| =$ _____

Exponents

1 Calculate:

(1) $\left(-\frac{3}{2}\right)^3 =$ _____

(2) $\left(-\frac{1}{3}\right)^4 =$ _____

(3) $-\frac{3^3}{2} =$ _____

2 $\frac{121^{16}}{121^{15}} =$ _____ .

$\frac{9^9}{9^7} =$ _____ .

$\frac{(-6)^{13}}{(6)^{12}} =$ _____ .

$\frac{-5^8}{5^6} =$ _____ .

3 Given that $a^n = 2$ and $b^n = 3$, $(a^3 b)^{2n} =$ _____ .

4 Given that $a^2 = 6$ and $b^3 = 9$, $(a \times b^2)^5 \times a^{15} \times b^8 \div (a^3)^6 \div b^{12} =$ _____ .

5 Calculate:

$(\sqrt{12}-3)^{0}+\sqrt{27}-\left(-\frac{\sqrt{3}}{3}\right)^{-1}=$ ( ) .

A. $1+\frac{8}{3}\sqrt{3}$ B. $1+2\sqrt{3}$ C. $\sqrt{3}$ D. $1+4\sqrt{3}$

6 Calculate: (Write the answer in exponential from)

$11^{3}\times 11^{4}=$ _____

7 Calculate:

$4^{3}=$ _____

8 Calculate:

$(2^2 \times 3^3 \times 5^5)^4 =$ _____

A. $2^6 \times 3^7 \times 5^9$ B. $2^2 \times 3^3 \times 5^{20}$ C. $2^2 \times 3^3 \times 5^9$ D. $2^8 \times 3^{12} \times 5^{20}$

9 Fold the 0.1 mm thick paper 4 times, its thickness is _____ mm.

A. 0.4 B. 1.6 C. 0.8 D. 3.2

10 Calculate:

$11^3 \div 11^2 =$ _____

11 $\sqrt{9}+\left|1-\sqrt{3}\right|+(6-\pi)^0-\left(-\frac{1}{2}\right)^{-2}=(\quad)$.

A. $\sqrt{3}-1$ B. $\sqrt{3}+1$ C. $2\sqrt{3}-4$ D. $2\sqrt{3}-2$

12 Given that $(2^4)^5=2^a$ and $((5^2)^3)^4=5^b$, $a+b=$ _____ .

13 Given that $2x+5y-3=0$, $4^x\cdot 32^y=$ _____

14 Given that $5^m = 4$, $5^n = 3$, $5^{2m+3n} =$ _____ .

15 The one digit of 2^{2013} is _____ .

A. 2 B. 4 C. 6 D. 8

16 Calculate:

$$-3^2 + |-3| + (-1)^{2013} \times (\pi - 3)^0 - \left(\frac{1}{2}\right)^{-1} .$$

17 Given that $3^m = 3^1 \times 9^3 \times 27^5$, $m =$ _____ .

18 The one digit of $2^{2018} \times 3^{2017} \times 4^{2016}$ is _____ .

19 Given that $3^a = 5$, $9^b = 10$, $3^{a+2b} =$ _____ .

20 Given that $3^{m+n} \times 6^m = 2^4 \times 3^{11}$, $m =$ _____ and $n =$ _____ .

21 Calculate:

(1) $31^2 =$ _____

(2) $32^2 =$ _____

(3) $44^2 =$ _____

(4) $45^2 =$ _____

22 If $2x^{3n}y^{m-4}$ and $-3x^9y^{2n}$ are like terms, then $m - n =$ _____ .

A. 1 B. -1 C. 7 D. -7

23 Calculate: (Write the answer in exponential from)

$(37^2)^{10} \times 37^3 =$ _____

24 A computer can do 7×10^9 operations per second, so it can do _____ operations in 5×10^2s.

25 Calculate:

$(-\frac{1}{4})^{-1} - (2 - \sqrt{2})^0 + \sqrt[3]{-27}$.

26 $\frac{17^6}{-17^7}$ = _____ .

$\frac{6^9}{-6^{11}}$ = _____ .

$\frac{(-2)^3}{(-2)^6}$ = _____ .

$\frac{2^5}{2^7}$ = _____ .

27 Calculate: (Write the answer in exponential from)

$8^{60} \div 8^{30} \div 8^{15} \div 8^8 \div 8^7$ = _____

28 Calculate: (Write the answer in exponential from)

(1) $11^{45} \div 11^{21}$ = _____

(2) $6^{66} \div 6^{39} \div 6^3$ = _____

29 Given that $M = 6^{2017} + 7^{2015}$ and $N = 6^{2015} + 7^{2017}$, compare M and N, then M _____ N.

30 Given that $2^m \times 4^3 \times 8^4 \times 16^m = 2^{38}$, m= _____ .

31 Calculate:(Write the answer in exponential from)
$2^{10} \times 3^{10} \times 4^{10} \times 5^{10}$ = _____

32 Calculate: (Write the answer in exponential from)

$(3 \times 7^3)^4 =$ _____

33 Calculate: (Write the answer in exponential from)

$3^7 \times 3^{10} =$ _____

Square Roots

1 $\sqrt{32} + \sqrt{32} =$ _____ .

$\sqrt{320} + \sqrt{32} =$ _____ .

$\sqrt{80} + \sqrt{27} =$ _____ .

2 Calculate:

$\sqrt{(-2)^2} - (\sqrt{0.4})^2 + \sqrt[3]{-27}$.

3 $\sqrt{48} + \sqrt{72} =$ _____ .

$\sqrt{16} + \sqrt{8} =$ _____ .

$\sqrt{52} - \sqrt{18} =$ _____ .

4 Calculate:

$(-1)^{2017} - \sqrt{16} + \sqrt[3]{8} =$ _____ .

5 Calculate:

$$\sqrt{\frac{1}{4}} - |-5| + \sqrt{1\frac{9}{16}} + \sqrt[3]{-2 + \frac{3}{64}} .$$

6 $\sqrt{99} - \sqrt{81} =$ _____ .

$\sqrt{64} + \sqrt{98} =$ _____ .

$\sqrt{48} - \sqrt{32} =$ _____ .

7 Calculate:

$$-\sqrt[3]{-27} + \sqrt{36} - (-\sqrt{5})^2 + |\sqrt{3} - 2| .$$

8 Calculate:

$$\sqrt{64} \div \sqrt[3]{27} - \sqrt{\left(-\frac{1}{3}\right)^2}\ .$$

NOTE

Equations and Functions

Equations with one variable

1 Solve the equations.

(1) $\frac{2x+1}{3} - \frac{x-3}{6} = 2$

(2) $\frac{x-7}{3} - \frac{1+x}{2} = 1$

2 Solve the following equation:

$\frac{3}{7}(5x-1) = \frac{4}{7}(5x-1) - 7$.

3 Solve the following equations:

(1) $-2[3-(4-x)]=3(2-x)$

(2) $-[4-2(2+x)]=4+4(5-x)$

4 Solve the equations below.

(1) $47-2x=13$, $x=$ _____

(2) $11=23-x-2x$, $x=$ _____

5 $\frac{3}{8}x - \frac{1}{3}x - 2 = \frac{1}{2}$, $x =$ _____ .

6 $x - \frac{1}{3}(2x - 1) = 1 - \frac{3x - 1}{4}$.

7 Simplify and find the value of the polynomial: $8xy + 18x - 5xy - 20x$; $x = 1$, $y = -2$.

8 Remove the parentheses of the following expressions.

(1) $5a - (x - 2y + 5z) =$ _____ .

(2) $2a^2 + (-3a - b) - 2(3c - 2d) =$ _____ .

9 Solve the following equation:

$3(2x - 3) - \frac{1}{3}(3 - 2x) = 5(3 - 2x) + \frac{1}{2}(2x - 3)$.

10 Solve the following equations:

(1) $2x + 7 = 3(x - 4)$

(2) $-4(2x - 3) = -7x$

11 Solve the equation: $\frac{1}{3} - \frac{1}{2}\left(\frac{3}{5}x - 7\right) = \frac{1}{2} - \frac{1}{3}\left(7 - \frac{3}{5}x\right)$.

12 Simplifying:

$3x^2 - \left[5x - \left(\frac{1}{2}x - 3\right) + 2x^2\right]$.

13 Solve the equation: $\frac{1}{11}(20x - 15) - \frac{5}{13}(3 - 4x) + \frac{20}{17}x = \frac{15}{17}$.

14 Combine like terms:

(1) $-3ab^2 + 10 + 2ab + 3b^2a - 7ba + 1$

(2) $(2y - 5z) - 3(y - 2z)$

15 Simplifying:

$$\frac{1}{3}(-3ax^2 - ax + 3) - (-ax^2 - \frac{1}{2}ax - 1) \ .$$

16 Simplifying :

$$(ab^2 + 2a^2b) + \frac{1}{2}(6ab - 4ab^2) - 2\left(\frac{5}{2}ab^2 + \frac{3}{2}ab\right) - 4\left(\frac{1}{4}ab^2 - \frac{1}{2}a^2b\right)$$

17 $3x + \frac{x-4}{2} = 2 - \frac{x+2}{5}$.

18 Remove the parentheses of the following expressions.

(1) $3x^2 - 3(x+6) =$ _____ .

(2) $-(x-2y) - \frac{3}{2}(-x^2+y^2) =$ _____ .

19 Combine like terms: $2b + 4a - 9b - a$.

20 Solve the equations below.

(1) $(3x + 5) - 2x = 29 - x$, $x =$ _____ .

(2) $16 - (12 - x) = 20$, $x =$ _____ .

21 Solve the following equations:

(1) $2x + 7 = 49$, $x =$ _____ .

(2) $12x - 43 = 6x + 11 - 2x + 2$, $x =$ _____ .

(3) $20x - 18 + 4x = 18x + 24$, $x =$ _____ .

22 Solve the equations below.

(1) $2 + 3(x - 26) = 52 - (x - 40)$

(2) $10 - 2(x - 3) = 3x - 4(5 - x)$

(3) $15 - 2(8 - 5x) = 3(10 + x) - 2(2 - 2x)$

23 Solve the following euqations:

(1) $0.3x + 1.2(x - 5) = \frac{3}{2}$

(2) $2.5x + \frac{3}{8} = -\frac{1}{8}$

System of Linear Equations

1 Solve the equation

(1) $\begin{cases} 2x + 3y = 2 \\ 3x + 2y = \frac{13}{6} \end{cases}$

(2) $\begin{cases} 2x - 3y = 0 \\ 9x - 10y = \frac{7}{6} \end{cases}$

2 Solve the equation

(1) $\begin{cases} y = 2x \\ 3x + y = 20 \end{cases}$

(2) $\begin{cases} x + y = 10 \\ x - y = 2 \end{cases}$

3 Solve the equation

(1) $\begin{cases} x + y = 17 \\ 2x - y = 10 \end{cases}$

(2) $\begin{cases} 5x + 3y = 13 \\ 2x - 3y = 1 \end{cases}$

4 Solve the equation

$\begin{cases} 3x + 4y = 18 \\ 5x + 2y = 16 \end{cases}$

5 Solve the equation

$$\begin{cases} 9u + 2v = 20 \\ 3u + 4v = 10 \end{cases}$$

6 Solve the equation

(1) $\begin{cases} x + 3y = 7 \\ 7x - 3y = 1 \end{cases}$

(2) $\begin{cases} 3x + 2y = 28 \\ 8x - 2y = 38 \end{cases}$

7 Solve the equation

(1) $\begin{cases} 3x + 2y = 75 \\ y = 2x - 1 \end{cases}$

(2) $\begin{cases} 4x + y = 50 \\ 7x - 3y = 21 \end{cases}$

8 Solve the system of linear equations.

$$\begin{cases} x - 2y = 0 \\ 2x + 3y = 21 \end{cases}$$

9 Solve the equation

(1) $\begin{cases} 3x + 2y = 7 \\ x + y = 3 \end{cases}$

(2) $\begin{cases} 2x - y = 7 \\ x + 2y = 16 \end{cases}$

10 Solve the system of linear equations.

$$\begin{cases} 2x + 2y = 20 \\ 3x - y - 10 = 0 \end{cases}$$

11 Solve the equation

(1) $\begin{cases} 2x - 5y = 1 \\ 4x + 3y = 15 \end{cases}$

(2) $\begin{cases} 3x + 5y = 14 \\ 2x + 3y = 9 \end{cases}$

12 Solve the system of linear equations.

$\begin{cases} 2y - x = 10 \\ 3x + 5y = 69 \end{cases}$

13 Solve the equation

(1) $\begin{cases} 3x - y = 5 \\ 5x + 2y = 12 \end{cases}$

(2) $\begin{cases} 2x + 5y = 17 \\ 4x + 6y = 22 \end{cases}$

14 Solve the equation

(1) $\begin{cases} 2x - y = 5 \\ x + 2y = 5 \end{cases}$

(2) $\begin{cases} 3x + 4y = 11 \\ 2x + y = 4 \end{cases}$

15 Solve the equation

(1) $\begin{cases} 3x + 2y = 13 \\ 4x - 3y = 6 \end{cases}$

(2) $\begin{cases} 3x - 4y = 8 \\ 2x - 5y = 3 \end{cases}$

16 Solve the equation

(1) $\begin{cases} 2x + 3y = 17 \\ 3x + 2y = 18 \end{cases}$

(2) $\begin{cases} 2000x + 1999y = 5999 \\ 14x + 15y = 43 \end{cases}$

17 Solve the equation

(1) $\begin{cases} 3x + 2y = 5 \\ 2x - y = 1 \end{cases}$

(2) $\begin{cases} 3x + y = 4 \\ 4x + 3y = 7 \end{cases}$

18 Solve the equation

(1) $\begin{cases} 5x + 7y = 52 \\ 5x + 2y = 22 \end{cases}$

(2) $\begin{cases} 7x + 5y = 41 \\ 8x + 5y = 44 \end{cases}$

19 Solve the equation

$\begin{cases} x - 5y = 0 \\ 3x + 2y = 17 \end{cases}$

20 Solve the system of linear equations.

$$\begin{cases} 4x + y = 16 \\ 2x + 3y = 28 \end{cases}$$

21 Solve the equation

$$\begin{cases} 9x + 2y = 20 \\ 3x + 4y = 10 \end{cases}$$

22 Solve the equation

(1) $\begin{cases} 4x + 3y = 19 \\ 5x - 2y = 18 \end{cases}$

(2) $\begin{cases} 2x + 3y = 25 \\ 5x + 4y = 52 \end{cases}$

23 Solve the equation

(1) $\begin{cases} x = 2y \\ x + 3y = 15 \end{cases}$

(2) $\begin{cases} y = x + 7 \\ x + y = 27 \end{cases}$

24 Solve the equation

(1) $\begin{cases} 3x - 4y = 8 \\ 2x - 5y = 3 \end{cases}$

(2) $\begin{cases} 3x + 5y = 14 \\ 2x + 3y = 9 \end{cases}$

25 Solve the equation

(1) $\begin{cases} 5x + 2y = 41 \\ 5y - 2x = 1 \end{cases}$

(2) $\begin{cases} 8x + 3y = 54 \\ 5x - 11y = 8 \end{cases}$

26 Solve the equation

(1) $\begin{cases} 2x - 3y = \dfrac{1}{15} \\ 9x - 10y = 1 \end{cases}$

(2) $\begin{cases} \dfrac{2(x-y)}{3} = \dfrac{x+y}{4} - 1 \\ 3(x+y) = 4(x-y) + 12 \end{cases}$

27 Solve the equation

(1) $\begin{cases} 2x + 5y = 19 \\ 3x + 2y = 12 \end{cases}$

(2) $\begin{cases} 3x - 2y = 5 \\ 2x + 5y = 16 \end{cases}$

28 Solve the equation

(1) $\begin{cases} 4x + 3y = 19 \\ 5x - 2y = 18 \end{cases}$

(2) $\begin{cases} 2x + 3y = 25 \\ 5x + 4y = 52 \end{cases}$

29 Solve the system of linear equations.

$$\begin{cases} 3x - 5 = y \\ 4x - 4 = 2y \end{cases}$$

30 Solve the equation

(1) $\begin{cases} y = 2x - 3 \\ 3x + 4y = 10 \end{cases}$

(2) $\begin{cases} 2x - y = 5 \\ 3x + 2y = 11 \end{cases}$

31 Solve the equation

(1) $\begin{cases} 4y + 5x = 66 \\ 3y + 7x = 82 \end{cases}$

(2) $\begin{cases} 12x + 7y = 117 \\ 13x + 6y = 122 \end{cases}$

32 Solve the equation

(1) $\begin{cases} x + 2y = 10 \\ 7x - 6y = 10 \end{cases}$

(2) $\begin{cases} 11x - 5y = 2 \\ 4x - y = 4 \end{cases}$

Linear Inequalities

1 Solve the following inequalities.

(1) $\frac{1 - 3x}{2} > 1 - 2x$.

(2) $x - \frac{1}{2}(4x - 1) < 2$

(3) $\frac{x - 1}{2} + 1 > \frac{x}{4}$.

(4) $0.01x - 1 < 0.02x$.

2 Solve the following inequalities:

(1) $2x + 7 \geqslant 3x - 4$

(2) $-5x - 6 \leqslant -7x$

3 Solve the following inequalities:

(1) $-3[7 - (2 - x)] \leqslant 2(3 - x)$

(2) $-[2 - 3(1 + x)] \geqslant 4 + 4(3 - x)$

4 Solve the following inequalities.

(1) $3x - 2x < 5$.

(2) $x - 6 > 2x$.

5 Solve the following inequalities:

(1) $0.3x + 3(2x - 0.1) \leqslant 0.6$

(2) $3.6x + 1.2 \leqslant -0.8$

6 Solve the following inequality:

$\frac{2x}{7} - \frac{5x-6}{14} > \frac{3}{2}$.

7 Solve the following inequalities:

(1) $4x - 5 + 3[5 - (x + 2)] \leqslant 2(x + 10)$

(2) $3[8 + 2(x - 4)] \leqslant 5(x + 7)$

8 Solve the following inequalities:

(1) $7 + 3[2x - (x + 5)] \leqslant 4(x + 4)$

(2) $2[4 + 3(x + 1)] \leqslant 4(x + 5)$

9 Solve the following inequalities:

(1) $3x + 6 \geqslant 4x - 3$

(2) $-4x - 8 \leqslant -6x$

10 Solve the following inequality:

$2\,[x - 3\,(x - 1)] \geqslant 4x$

11 Solve the following inequalities.

(1) $\frac{x}{2} > \frac{x}{3}$.

(2) $2x - 7 > 5 - 2x$.

12 Solve the following inequality:

$\frac{2x - 1}{3} - \frac{6x - 7}{4} \geqslant \frac{2x + 5}{12} - 1$.

13 Solve the following inequalities:

(1) $-3x \leqslant -4x + 6$

(2) $4x \geqslant 3(x - 6)$

14 Solve the following inequalities:

(1) $\dfrac{2x - 6}{-4} \leq x + 3$

(2) $\dfrac{x}{3} \leq 2(4 - 3x)$

15 Solve the following inequalities:

(1) $-2[3 - (4 - x)] \leqslant 3(2 - x)$

(2) $-[4-2(2+x)] \geqslant 4+4(5-x)$

16 Solve the following inequalities.

(1) $\frac{2x-1}{3} \leqslant 3$

(2) $\frac{x-1}{2} > \frac{2(2x-1)}{3}$

17 Solve the following inequalities.

(1) $6x-2>10$

(2) $3+4x<27$

18 Solve the following inequalities:

(1) $\frac{x}{2} + 3 \leqslant 4x + 6$

(2) $\frac{7x + 4}{3} \leqslant -\frac{4x}{3} + 5$

19 Solve the following inequalities:

(1) $0.2x + 1.4(x - 2) \leqslant \frac{4}{6}$

(2) $3.6x + \frac{2}{5} \leqslant -\frac{3}{5}$

Systems of Linear Inequalities

1 Solve the following inequality:

$$\begin{cases} \frac{2x-3}{3} - 2 \leqslant \frac{x+2}{6} \\ \frac{1-2x}{4} - x - 1 \leqslant 1 \end{cases}$$

2 Solve the following compound inequalities:

$$\begin{cases} 2x - 2 + 6 \geqslant 3x + 2 \\ 1 + x < 6 + 3(x - 1) \end{cases}$$

3 Solve the following compound inequalities:

$$\begin{cases} 1.1x - 2 \leqslant 7 - 3.4x \\ 2.2x - 3.4x - 1 \leqslant 2 \end{cases}$$

4 Solve the following compound inequality:

$$\begin{cases} 3(x+2) \geqslant 4x+1 \\ 2+2x < 6+3(x-2) \end{cases}$$

5 Solve the following compound inequalities:

$$\begin{cases} \frac{2x-4}{6} - 1 \leqslant \frac{x+2}{4} \\ \frac{1-2x}{5} - x - 1 \leqslant 1 \end{cases}$$

6 Solve the following compound inequalities:

$$\begin{cases} 5x - 2 \leqslant 10 - x \\ \frac{1-2x}{4} - \frac{6x-1}{8} \leqslant 1 \end{cases}$$

7 Solve the following compound inequality:

$$\begin{cases} x - 2 + 6 \geqslant 3x + 2 \\ 2 + x < 5 + 2(x - 1) \end{cases}$$

8 Solve the following compound inequalities:

$$\begin{cases} 4x - 1 \leqslant 14 - 2x \\ \frac{1-2x}{3} - \frac{2x-1}{6} \leqslant 1 \end{cases}$$

9 Solve the following compound inequalities:

$$\begin{cases} 4x + 2 > -6 \\ x + 1 \leqslant 3 \end{cases}$$

10 Solve the following systems of inequalities:

(1) $\begin{cases} 2x + 4 > -2 - x \\ -3x \geq -9 \end{cases}$

(2) $\begin{cases} \frac{x+2}{3} \geq 2 - x \\ \frac{x}{-2} \geq x - 5 \end{cases}$

11 Solve the following compound inequalities:

$\begin{cases} 2x - 1 > 1 \\ x - 1 \leqslant 3 \end{cases}$

12 Solve the following inequality:

$\begin{cases} 2x - 2 > 2 \\ x - 2 \leqslant 1 \end{cases}$

13 Solve the following compound inequalities:

$$\begin{cases} x - 4 + 10 \geqslant 2(x + 2) \\ 2 + 3x < 8 + 4(x - 1) \end{cases}$$

14 Solve the following inequality:

$$\begin{cases} 3x - 1 \leqslant 14 + x \\ \frac{1-x}{2} - \frac{2x-1}{6} \leqslant 1 \end{cases}$$

15 Solve the following compound inequalities:

$$\begin{cases} 4x + 1 > -7 \\ x + 1 \leqslant 4 \end{cases}$$

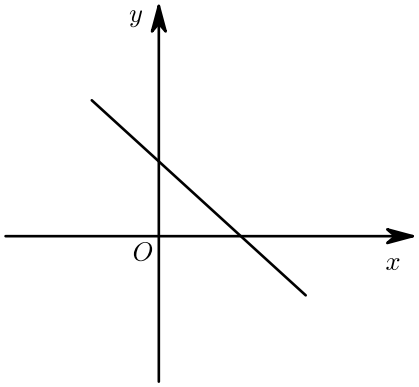
16 Solve the following compound inequalities:

$$\begin{cases} \frac{2x-3}{8} - 1 \leqslant \frac{x+2}{6} \\ \frac{1-2x}{3} - 2x - 1 \leqslant 1 \end{cases}$$

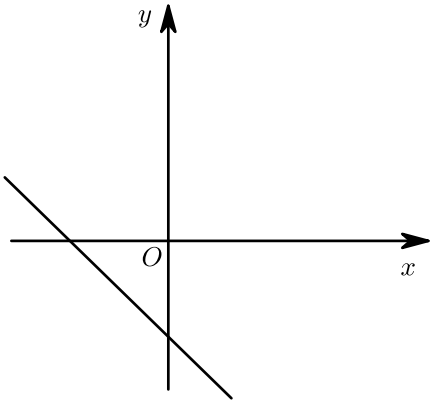
Slope and Intercept of Linear Equations

1 Which of the graphs can represent line $y = ax + \frac{1}{a}$?

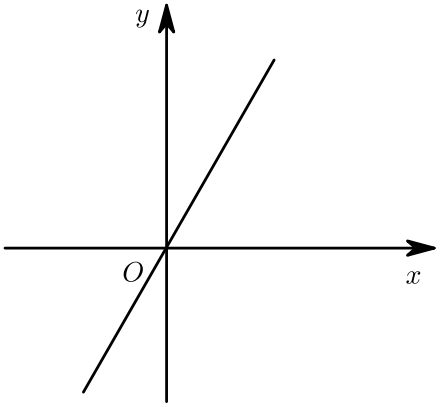
A.



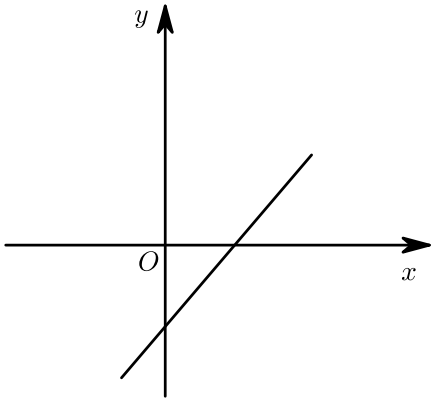
B.



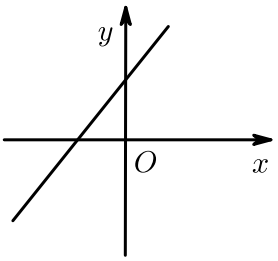
C.



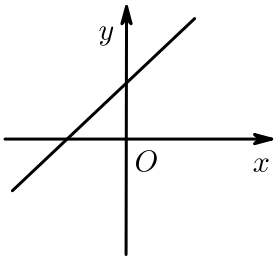
D.



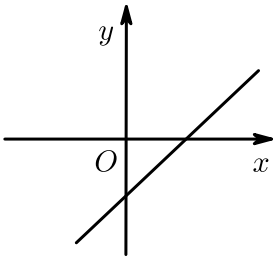
2 The graph below shows the line $y = kx + b$. Which graph can represent $y = -bx + k$?



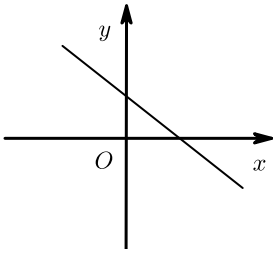
A.



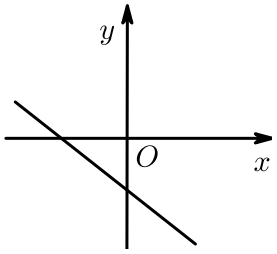
B.



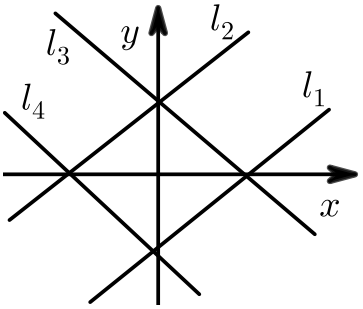
C.



D.

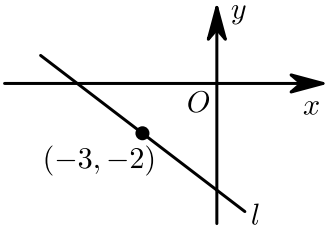


3 Choose the graph that represents the line $y = -2x - 1$.



A. l_1 B. l_2 C. l_3 D. l_4

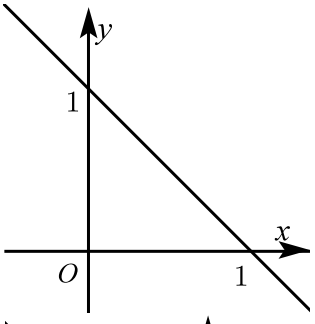
4 The graph of a line passing through point $(-3, -2)$ is shown in the picture. If the line also passes through point $(-2, a)$, point $(0, b)$, point $(c, 0)$, and point $(d, -1)$, which of the statements is right?



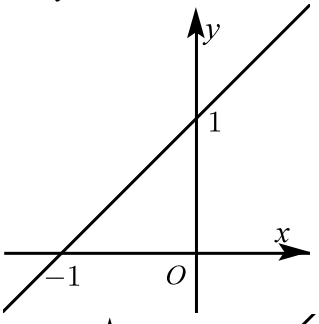
A. $a = 3$ B. $b > -2$ C. $c < -3$ D. $d = 2$

5 Choose the graph that represents the line $y = x - 1$.

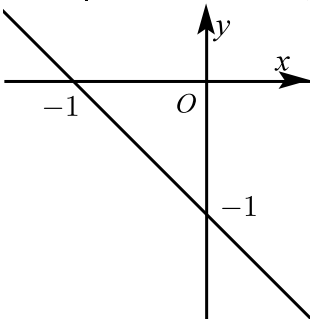
A.



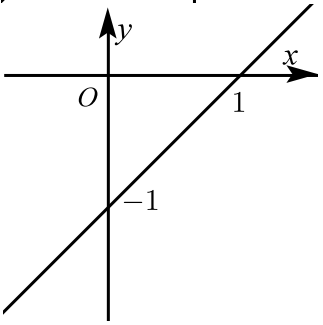
B.



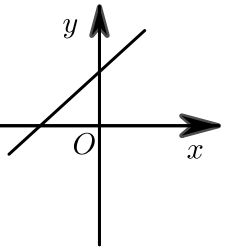
C.

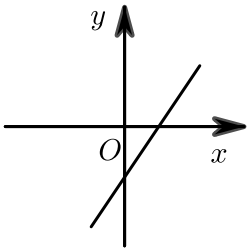


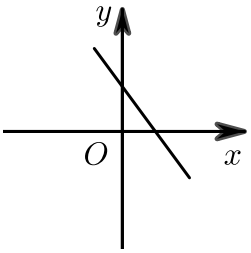
D.

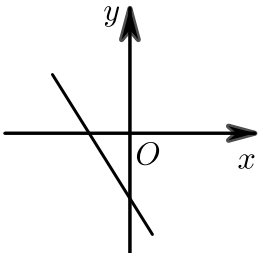


6 Choose the graph that represents the line $y = -x + 4$.

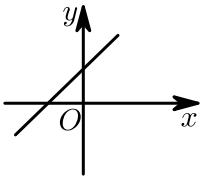
A. 

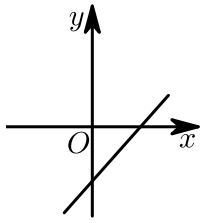
B. 

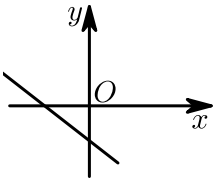
C. 

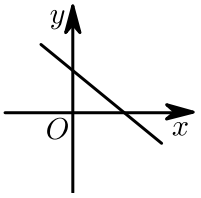
D. 

7 GIven that point $P(m, n)$ is in the fourth quadrand, which graph can represent line $y = nx + m$?

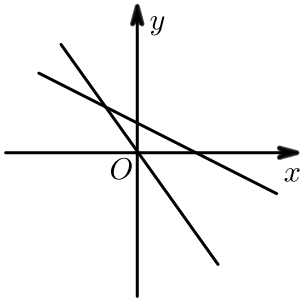
A. 

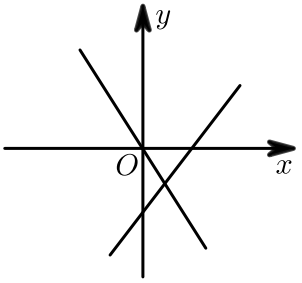
B. 

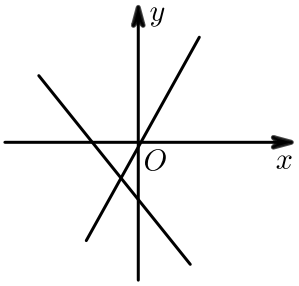
C. 

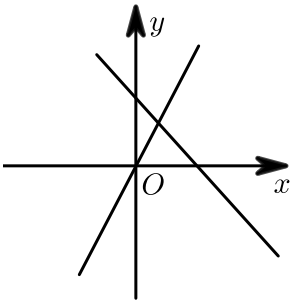
D. 

8 Which of the graph can represents line $y = kx$ and line $y = -kx - k\ (k \neq 0)$?

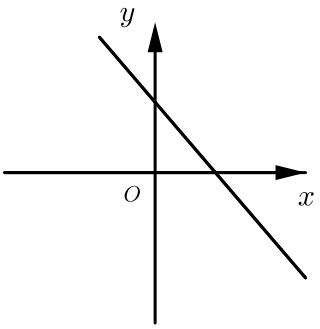
A. 

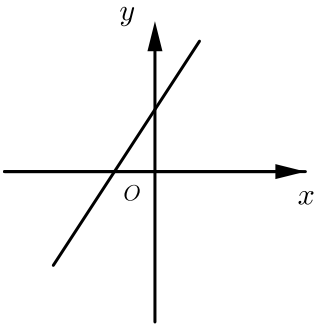
B. 

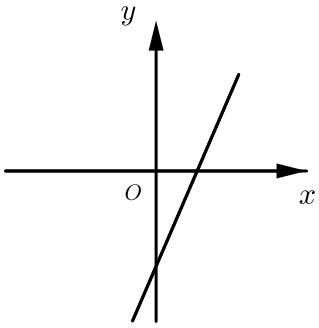
C. 

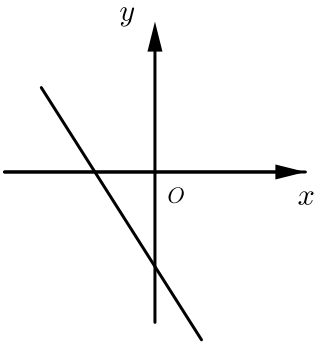
D. 

9 Choose the graph that represents the line $y = -2x + 3$.

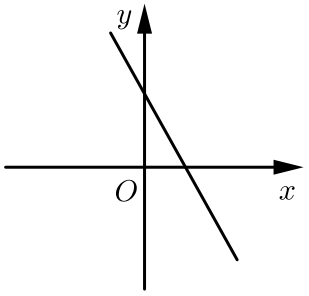
A. 

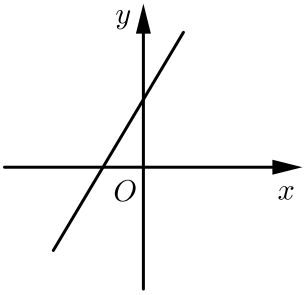
B. 

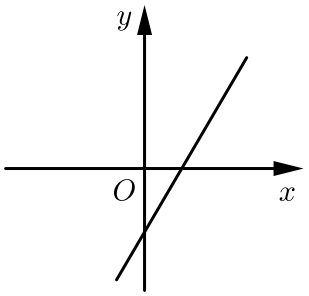
C. 

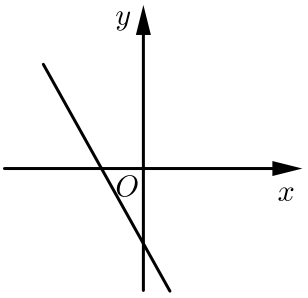
D. 

10 Choose the graph that represents the line $y = 2x + 2$.

A. 

B. 

C. 

D. 

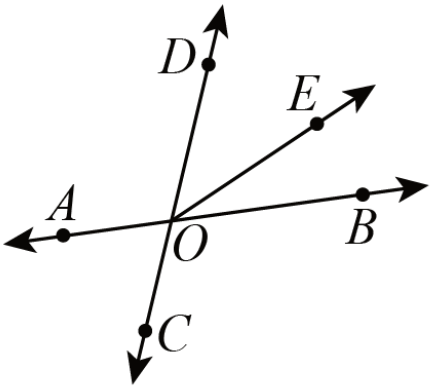
NOTE

NOTE

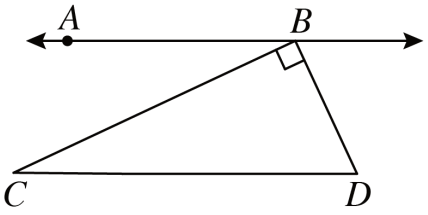
Geometry

Angles

1 As shown in the figure, $\overleftrightarrow{AB}$ and $\overleftrightarrow{CD}$ intersect at point O, with $m\angle AOC = 60^\circ$. $\overrightarrow{OE}$ bisects $\angle BOD$ and $m\angle BOE : m\angle EOD = 1 : 2$. As such, $m\angle DOE =$ _____ $^\circ$.

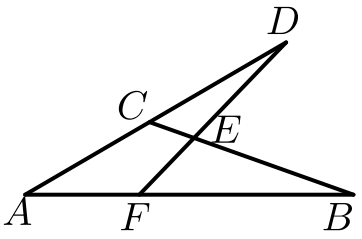


2 As shown in the figure, $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, $\overline{CB} \perp \overline{DB}$, and $m\angle D = 65^\circ$. Then $m\angle ABC$ is equal to ( ) .



A. 25° B. 35° C. 50° D. 65°

3 As shown in the figure, it is given that $m\angle A = 30^\circ$, $m\angle BEF = 105^\circ$ and $m\angle B = 15^\circ$. Then $m\angle D =$ ( ) .

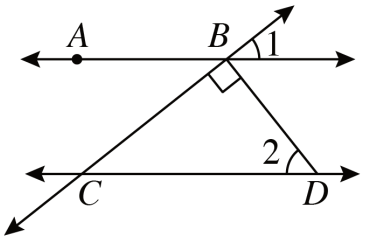


A. 25° B. 35° C. 45° D. 30°

4 One of the angles of an isosceles triangle has a measure of 80°, then its vertex angle has a measure of ( ) .

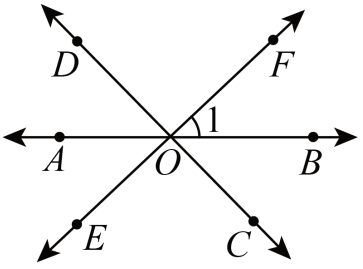
A. 80° B. 80° or 20° C. 80° or 50° D. 20°

5 As shown in the figure below, $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$, $\overline{DB} \perp \overline{BC}$, $m\angle 1 = 40°$, then $m\angle 2$ is ( ) .



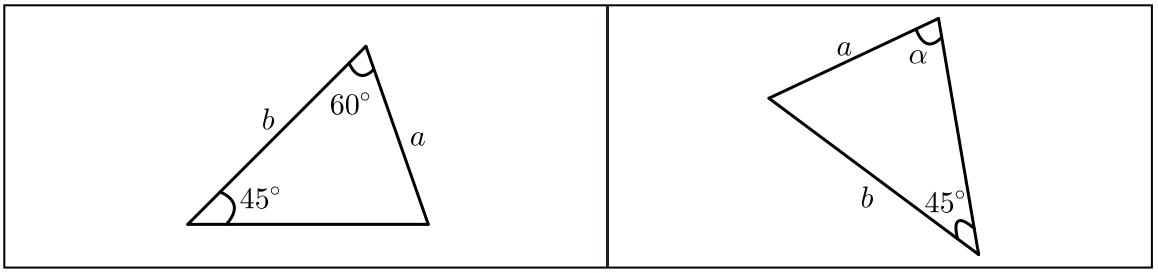
A. $40°$ B. $50°$ C. $60°$ D. $140°$

6 As shown in the figure below, the supplementary angle of $\angle 1$ is ( ) .



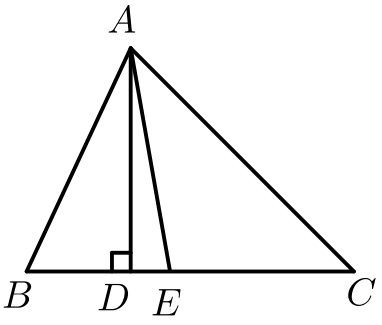
A. $\angle BOC$ B. $\angle BOC$ and $\angle AOF$
C. $\angle AOF$ D. $\angle BOE$ and $\angle AOF$

7 Given that the triangles in the diagram are congruent, then $m\angle\alpha$ is equal to ( ) .

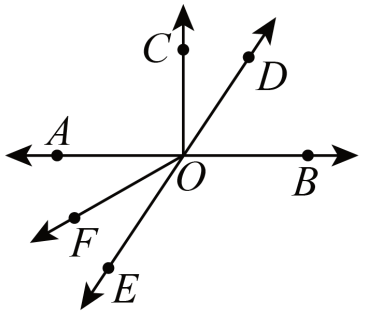


A. $105°$ B. $75°$ C. $60°$ D. $45°$

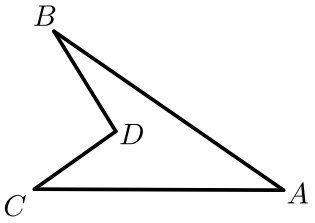
8 As shown in the figure below, in $\triangle ABC$, $\overline{AD}$ is the altitude and $\overline{AE}$ is the angle bisector of $\angle BAC$. If $m\angle B = 65°$, $m\angle C = 45°$, then $m\angle DAE$ is _____ .



9 As shown in the figure, $\overleftrightarrow{AB}$ and $\overleftrightarrow{DE}$ intersect at point O. $\overrightarrow{OC} \perp \overleftrightarrow{AB}$, and $\overrightarrow{OF}$ is the bisector of $\angle AOE$. If $m\angle COD = 36^\circ$, then $m\angle AOF =$ _____ .

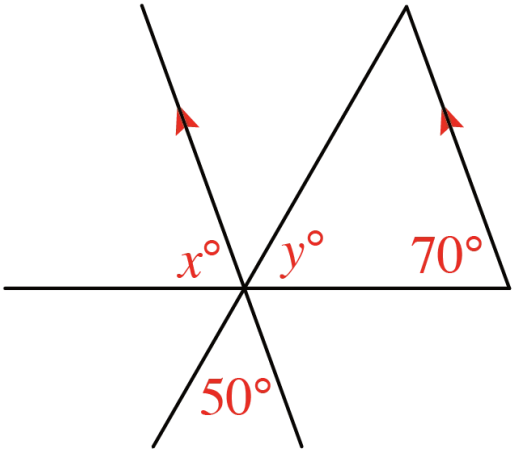


10 As shown in the figure below, $m\angle BDC = 98^\circ$, $m\angle C = 38^\circ$, $m\angle B = 23^\circ$, then $m\angle A =$ ( ) .

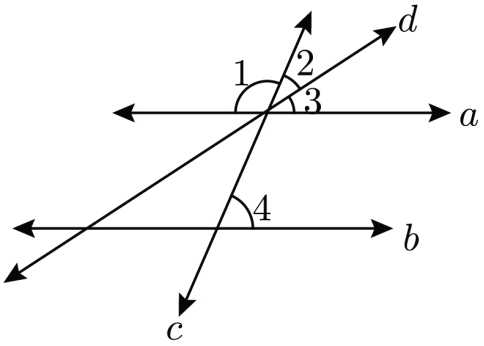


A. 61° B. 60° C. 37° D. 39°

11 Find the values of x and y.



12 As shown in the figure below, $a \parallel b$ and line d is transversal. Given that $m\angle 2 = m\angle 3$ and $m\angle 1 = 110^\circ$, find $m\angle 2$ and $m\angle 4$.



Congruent Triangles

1 One of the base angles of an isosceles triangle has a measure of 50°, then the vertex angle has a measure of _____ $^\circ$.

2 Which of the following statements is correct? ( )

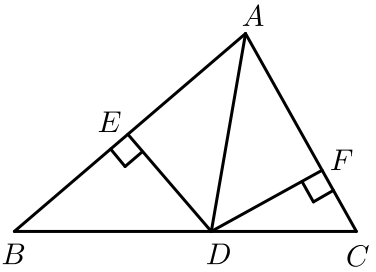
A. An obtuse triangle must not be an isosceles or an equilateral triangle

B. An isosceles triangle must be an acute or right triangle

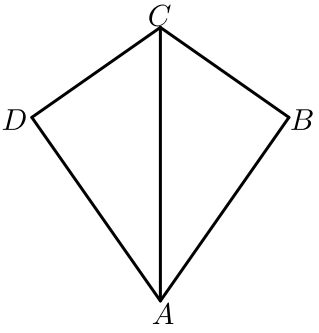
C. A right triangle must not be an isosceles or an equilateral triangle

D. An equilateral triangle must not be an obtuse triangle or a right triangle

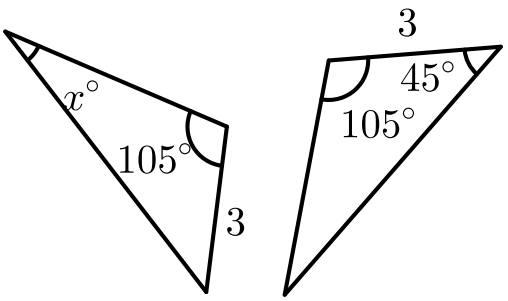
3 As shown in the figure, in $\triangle ABC$, $\overline{AD}$ bisects $m\angle BAC$ and intersects with $\overline{BC}$ at point D, $\overline{DE} \perp \overline{AB}$ at point E, and $\overline{DF} \perp \overline{AC}$ at point F. If $AC = 4$, $DE = 2$, then $\triangle ACD$ has an area of _____ .



4 As shown in the figure, in $ABCD$, $CB = CD$, if $m\angle ACD = m\angle ACB = 60°$, and $m\angle BAC = 35°$, then $m\angle CDA$ is equal to _____ ° .



5 As shown in the figure, two triangles are congruent. Then x has a value of ( ) .



A. 30 B. 45 C. 50 D. 85

6 Among the following statements, the correct one is ( ) .

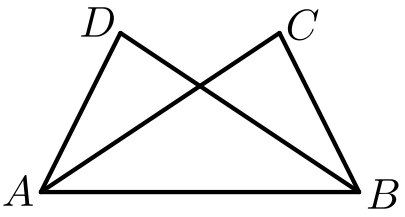
A. All isosceles triangles are acute triangles.

B. All equilateral triangles are isosceles triangles.

C. It doesn't exist a triangle that is obtuse as well as isosceles.

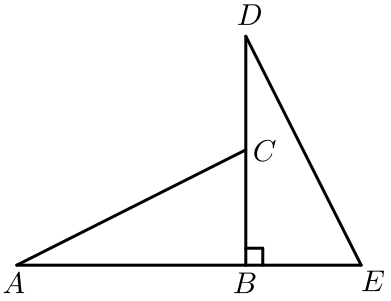
D. If a triangle has two acute angles, then it must be an acute triangle.

7 As shown in the figure below, which of the following conditions can not be used to prove $\triangle ABD \cong \triangle BAC$ ( ) .



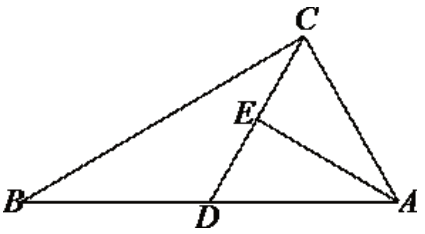
A. $m\angle D = m\angle C$, $m\angle BAD = m\angle ABC$
B. $m\angle BAD = m\angle ABC$, $m\angle ABD = m\angle BAC$
C. $BD = AC$, $m\angle BAD = m\angle ABC$
D. $AD = BC$, $BD = AC$

8 As shown in the figure, $\overline{DB} \perp \overline{AE}$, $AB = DB$, $AC = DE$, then $\triangle ABC \cong \triangle DBE$ is true based on ( ) .



A. SAS B. ASA C. AAS D. HL

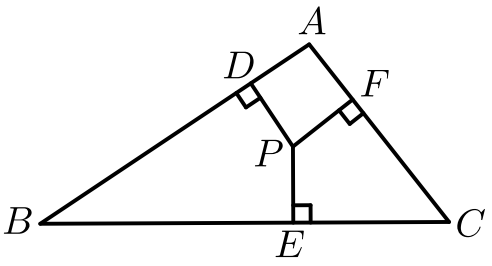
9 As shown in the figure below, in $\mathrm{Rt}\triangle ABC$, $m\angle ACB = 90^\circ$, $AC = 2$, D is the midpoint of $\overline{AB}$, $CD = \frac{1}{2}AB = AD$, E is the midpoint of $\overline{CD}$ and $\overline{AE} \perp \overline{CD}$. $BC =$ _____ .



10 The sum of the measure of the interior angle of a polygon is three times the sum of measure of its exterior angles. The number of sides of this polygon is ( ) .

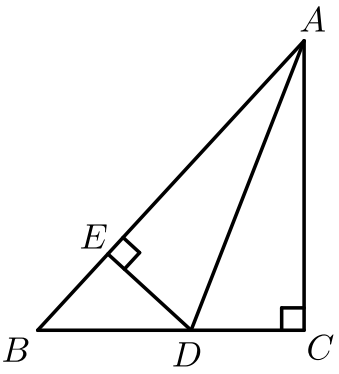
A. 6　　B. 7　　C. 8　　D. 9

11 As shown in the figure, point P is one point inside $\triangle ABC$. $\overline{PD} \perp \overline{AB}$, $\overline{PE} \perp \overline{BC}$, $\overline{PF} \perp \overline{AC}$, and $PD = PE = PF$. Then point P is ( ) .



A. the intersection point of three perpendicular bisectors of $\triangle ABC$
B. the intersection point of three angle bisectors of $\triangle ABC$
C. the intersection point of three heights of $\triangle ABC$
D. the intersection point of three medians of $\triangle ABC$

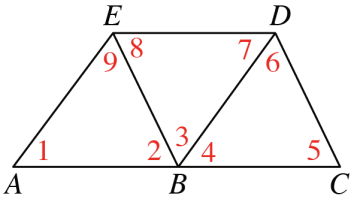
12 As shown in the figure, in $\triangle ABC$, $m\angle C = 90°$, $\overline{AD}$ bisects $\angle BAC$. Draw $\overline{DE} \perp \overline{AB}$ at E through D. If $BC = 9$ and $BE = 3$, then the perimeter of $\triangle BDE$ is ( ) .



A. 15 B. 12 C. 9 D. 6

13 Use the given information to name the segments (if any) that must be parallel.

1. $\angle 3 \cong \angle 6$
2. $\angle 9 \cong \angle 6$
3. $m\angle 7 + m\angle AED = 180°$



NOTE

Word Problems

Currency Exchange

1 Suppose that 1 U.S. dollar is worth 0.96 euro. Sherry is traveling in Europe, and she wants to buy a cup of coffee, which costs 4.8 euros. How many U.S. dollars does the cup of coffee cost?

2 Suppose that one U.S. dollar is worth 1.26 Canadian dollars. Lars is traveling in Canada, and he wants to buy a book, which costs 78 Canadian dollars. How many U.S. dollars is the book (round to the nearest hundredth)?

3 Suppose that one U.S. dollar is worth 0.96 euro. Sherry is traveling in Europe, and she wants to buy a burger, which costs 4.4 euros. How many U.S. dollars does the burger cost (round to the nearest hundredth)?

4 Suppose that one U.S. dollar is worth 120 Japanese yens. Alex invests $480,000$ yens in the Japenese stock money. How much are Alex's stocks worth in U.S. dollars?

5 Suppose that one U.S. dollar is worth 1.25 Canadian dollars. Lars is traveling in Canada, and he wants to buy a book, which costs 32 Canadian dollars. How many U.S. dollars does the book cost?

6 Suppose that one U.S. dollar is worth 120 Japanese yens. Sherry invests $240,000$ yens in the Japenese stock market. How much are Sherry's stocks worth in U.S. dollars?

7 Suppose that 1 U.S. dollar is worth 120 Japanese yens. Sherry invests $144,000$ yens in the Japenese stock market. How much are Sherry's stocks worth in U.S. dollars?

8 Suppose that one U.S. dollar is worth 0.84 euro. Sherry is traveling in Europe, and she wants to buy a burger, which costs 4.3 euros. How many U.S. dollars is the burger (round to the nearest hundredth)?

9 Suppose that 1 U.S. dollar is worth 1.25 Canadian dollars. Sherry is traveling in Canada, and she wants to buy a book, which costs 64 Canadian dollars. How many U.S. dollars does the book cost?

10 Suppose that one U.S. dollar is worth 110 Japanese yens. Sherry invests $385,000$ yens in the Japenese stock market. How much are Sherry's stocks worth in U.S. dollars?

11 Suppose that 1 U.S. dollar is worth 110 Japanese yens. Sherry invests $165,000$ yens in the Japenese stock market. How much are Sherry's stocks worth in U.S. dollars?

12 Suppose that one U.S. dollar is worth 6.5 rmbs. Tom is traveling in China, and he wants to buy a cup of coffee, which costs 32 rmbs. How many U.S. dollars does Tom need to buy the cup of coffee (round to the nearest hundredth)?

13 Suppose that 1 U.S. dollar is worth 1.26 Canadian dollars. Sherry is traveling in Canada, and she wants to buy a book, which costs 82 Canadian dollars. How many U.S. dollars is the book (round to the nearest hundredth)?

14 Suppose that one U.S. dollar is worth 110 Japanese yens. Alex invests $330,000$ yens in the Japenese stock money. How much are Alex's stocks worth in U.S. dollars?

15 Suppose that one U.S. dollar is worth 7 Chinese yuans. Tom is traveling in China, and he wants to buy a cup of coffee, which costs 49 Chinese yuans. How many U.S. dollars does the cup of coffee cost?

16 Suppose that one U.S. dollar is worth 7 Chinese yuans. Tom is traveling in China, and he wants to buy a phone case, which costs 17.5 Chinese yuans. How many U.S. dollars does the cup of coffee cost?

17 Suppose that 1 U.S. dollar is worth 0.84 euro. Sherry is traveling in Europe, and she wants to buy a cup of coffee, which costs 3.6 euros. How many U.S. dollars is the cup of coffee (round to the nearest hundredth)?

18 Suppose that one U.S. dollar is worth 7 Chinese yuans. Tom is traveling in China, and he wants to buy a cup of tea, which costs 10.5 Chinese yuans. How many U.S. dollars does the cup of tea cost?

Word Problems with Equations in one variable

1 A truck of goods needs to be delivered to the mall within a specified time. If the driver James drives at 60 mph, he can arrive 30 minutes earlier; if he drives at 40 mph, he will be 15 minutes late. The specified time is _____ hours.

2 Two railways A and B have a total length of 1052 miles. The length of railway A is 169 miles less than twice the length of railway B. The length of railway A is _____ miles.

3 Five times a number increased by seven is equal to forty-seven. What is the number?

4 A college has two depositional systems classes with a total of 237 students. One class has 45 fewer students than the other class. How many students are in each class?

5 Teddy is driving from San Jose to Reno. The distance between San Jose and Reno is 300 miles. Teddy first drives 1.5 hours at a speed of 60 miles per hour. He then drives at a speed of 70 miles per hour for some time and arrives at Reno. For how many hours does he drive at a speed of 70 mph?

6 162 guests attended a banquet. Three servers provided their beverages. The second server helped three times as many people as the first server and the third server helped twice as many people as the first server. The first server helped _____ guests.

7 There are 20 questions in an exam. You can earn 5 points for a correct answer but miss 1 point for a wrong answer. Sam answered all the questions and earned 70 points in total. He answered _____ questions correctly.

8 When Garen was born, his father was 27 years old, and now his father's age is 4 times that of Garen. Garen is _____ years old now.

9 A fruit store is selling bananas and apples. The price of bananas is 1.5 dollars per pound, and the price of apples is 1.6 dollars per pound. Sherry spends 10.9 dollars buying 3 pounds of bananas and some apples. How many pounds of apples does Sherry purchase?

10 Olivia is taking a Uber from the airport to her home. Suppose Uber charges the first 4 miles at the rate of 1.6 dollars per mile, and 1.2 dollars per mile after the first 4 miles. The amount Olivia pays for the drive is 16 dollars. The distance between the airport and her home is _____ miles.

11 In the activity of "Reading Month", some books were distributed to students in a class. If each student gets 4 books, there will be a remaining of 12 books; if each student gets 5 books, there will be a shortage of 16 books. How many students are there in this class?

12 The sum of three consecutive odd integers is 57. Find the smallest among them.

13 The length of a rectangle is twice its width. If the perimeter is 72 meters, find the length of the rectangle.

14 The sum of two consecutive integers is 49. Find the two numbers.

15 A baseball team played 63 games and won twice times as many games as it lost. How many games did the team lose?

16 There are two numbers whose sum is 72. One number is twice the other. What is the smaller number?

17 The cake store offers two kinds of cakes: chocolate cake and cheesecake. The price of a slice of chocolate cake is 3.5 dollars, and the price of a slice of cheesecake is 3 dollars. David spends 57 dollars and buys 12 slices of chocolate cake and some cheesecake for his friends. How many slices of cheesecake does David buy?

18 Abigail is 6 years older than Jonathan. Six years ago she was twice as old as he. How old is Jonathan?

19 Teams A and B had a football match. It is stipulated that a win will be awarded 4 points, a draw will be awarded 1 point, and a loss will be awarded 0 point. Teams A and B had a total of 6 games. Given that Team A has not lost a single game and Team A has a total of 9 points, then Team A has won _____ games.

Word Problems of Linear Equations

1 Jake is going to the library by taxi which is 8 miles away from his home. The standards of the taxi fare are :

Mileage	Fare/dollars
Not exceed 4 miles (including 4 miles)	7.00
Exceed 4 miles (the excess part)	1.60/mile

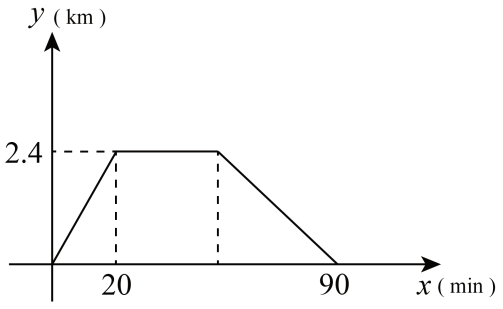
When the mileage exceeds 4 miles, the equation of the relationship between the fare(y) and the milage(x) is _____ ; the fare that Jake should pay is _____ dollars.

2 Tom wants to pay his water bill. The fees for the first 25 gallons of water is 0.6 dollars per gallon, and 0.4 dollars per gallon after the first 25 gallons. When the water usage exceeds 25 gallons, the equation that represents the relationship between the bill(y) and usage(x) is _____ . If Tom uses 65 gallons of water this month, the amount he should pay is _____ dollars.

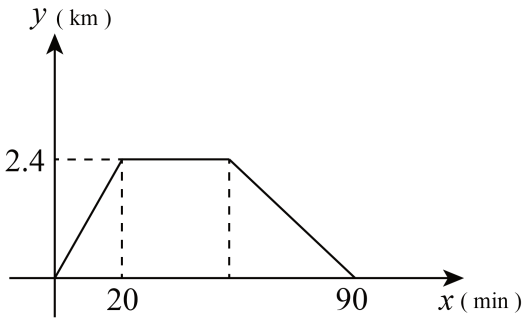
3 Frank went to a gym that is 10.75 miles away from his home. He first walked to the bus stop at a speed of 3 miles per hour. He then took a bus at the speed of 50 miles per hour and arrived at the gym. He spent 0.45 hours in total. How much time (in hour) did he spent on walking and bus respectively?

4 Jason wants to pay his water bill. The fees for the first 30 gallons of water is 0.7 dollars per gallon, and 0.35 dollars per gallon after the first 30 gallons. When the water usage exceeds 30 gallons, the equation that represents the relationship between the bill(y) and usage(x) is _____ . If Jason uses 76 gallons of water this month, the amount he should pay is _____ dollars.

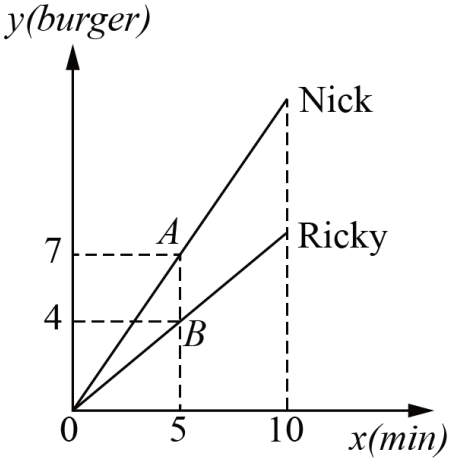
5 One day, Sherry planned to go to the mall to buy some clothes and then went back home. The relationship between the distance from home and the time after her left home is shown in the figure below. If Sherry spent 40 min to buy clothes in the mall, the distance from home after her left home 75 min is _____ km.



6 One day, Sherry planned to go to the mall to buy some clothes and then went back home. The relationship between the distance from home and the time after she left home is shown in the figure below. If Sherry spent 40 min to buy clothes in the mall, the distance from home after she left home 70 min is _____ km.



7 Nick and Ricky are making burgers in a restaurant. As the figure shown below, $\overline{OA}$ and $\overline{OB}$ are the graphs of the linear equation that represent Nick's and Ricky's burger making progress. The y axis shows how many burgers each of them made and the x axis shows how much time they used. At time 10 minutes, Nick has made _____ more burgers than Ricky made.



8 Sherry is going to the restaurant by taxi which is 7 miles away from her home. The standards of the taxi fare are:

Mileage	Fare/dollars
Not exceed 5 miles (including 5 miles)	9.00
Exceed 5 miles (the excess part)	1.6/mile

When the mileage exceeds 5 miles, the equation of the relationship between the fare and the mileage is _____ ; the fare that Sherry should pay is _____ dollars.

9 Jake is going to the library by taxi which is 7 miles away from his home. The standards of the taxi fare are:

Mileage	Fare/dollars
Not exceed 3 miles (including 3 miles)	7.50
Exceed 3 miles (the excess part)	1.60/mile

When the mileage exceeds 3 miles, the equation of the relationship between the fare and the milage is _____ ; the fare that Jake should pay is _____ .

10 Tina is taking a Uber from the airport to her home. The distance between the airport and her home is 14 miles. Uber charges the first 4 miles at the rate of 1.4 dollars per mile, and 0.68 dollars per mile after the first 4 miles. When the distance is more than 4 miles, the equation of the relationship between distance and fare is _____ . The amount Tina should pay is _____ dollars.

11 Sherry is taking a Uber from the airport to her home. The distance between the airport and her home is 15 miles. Uber charges the first 4 miles at the rate of 1.3 dollars per mile, and 0.73 dollars per mile after the first 4 miles. When the distance is more than 4 miles, the equation of the relationship between the distance and the fare is _____ . Sherry should pay _____ dollars in total.

12 Tom is going to the library by taxi which is 8 miles away from his home. The standards of the taxi fare are:

Mileage	Fare/dollars
Not exceed 3 miles (including 3 miles)	8.00
Exceed 3 miles (the excess part)	1.50/mile

When the mileage exceeds 3 miles, the equation of the relationship between the fare and the mileage is _____ ; the fare that Tom should pay is _____ dollars.

13 Adam wants to pay his water bill. The fees for the first 30 gallons of water is 0.6 dollars per gallon, and 0.4 dollars per gallon after the first 30 gallons. When the water usage exceeds 30 gallons, the equation that represents the relationship between the bill and usage is _____ . If Adam uses 70 gallons of water this month, the amount he should pay is _____ dollars.

14 Olivia is going to the restaurant by taxi which is 5 miles away from her home. The standards of the taxi fare are:

Mileage	Fare/dollars
Not exceed 3 miles (including 3 miles)	8.20
Exceed 3 miles (the excess part)	1.75/mile

When the mileage exceeds 3 miles, the equation of the relationship between the fare and the milage is _____ ; the fare that Olivia should pay is _____ .

NOTE

NOTE

Crazy Math

AMC 8 Mock

1 In the long multiplication below, A, B, C, and D are distinct digits. What is $A+B+C+D$?

$$\begin{array}{cccc} & A & B & C & D \\ \times & & & & 9 \\ \hline & D & C & B & A \end{array}$$

A. 15 B. 17 C. 18 D. 20 E. 23

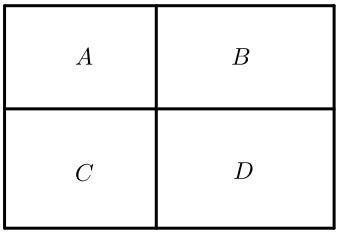
2 What is the smallest integer n larger than the product of $(2-1)\times(2+1)\times(4+1)\times(16+1)\times(256+1)\times\cdots\times(2^{64}+1)$ is the square of an integer?

A. 2^{65} B. 2^{97} C. 2^{128} D. 2^{256} E. 2^{512}

3 James, Bowen and Eddie walk 60 meters, 50 meters and 40 meters per minute, respectively. James starts from B to A. At the same time, Bowen and Eddie start from A to B. 15 minutes after James meets Bowen, James meets Eddie. What is the distance between A and B?

A. 16500 B. 16000 C. 15600 D. 15000 E. 14500

4 In the figure, a large rectangle is divided into 4 smaller rectangles. Given that the areas of rectangle A, B and C is 186, 248 and 216 square centimetres, respectively, what is the area of rectangle D in square centimetres?

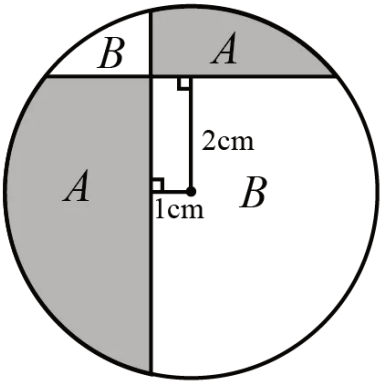


A. 252 B. 248 C. 240 D. 232 E. 288

5 If $3^p + 4^r = 265$, $9^p + 5^t = 206$, and $5^t + 4^r = 381$, what is the product of p, r, and t?

A. 12 B. 15 C. 18 D. 24 E. 32

6 As shown in the figure, there are two lines perpendicular to each other in the circle with a radius of 4 cm. What is the difference between the area of the shadow part and the area of the blank part? (use 3.14 for π)



A. 2 cm^2 B. 4 cm^2 C. 6 cm^2 D. 8 cm^2 E. 10 cm^2

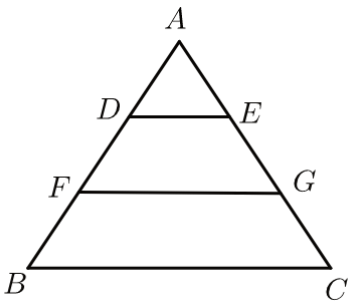
7 Nini wrote several continuous natural numbers starting from 1 on the blackboard. She calculated the average of the numbers on the blackboard, which was $14\frac{4}{9}$. But she accidentally missed a number. The missed number was _____ .

A. 13 B. 14 C. 15 D. 16 E. 17

8 Four little monkeys eat peaches. The first monkey eats $\frac{2}{3}$ of the total number of the other three. The second monkey eats $\frac{1}{4}$ of total number of the other three. The third monkey eats $\frac{1}{5}$ of total number of the other three. The fourth monkey eats 42 peaches. How many peaches do the four monkeys eat in total?

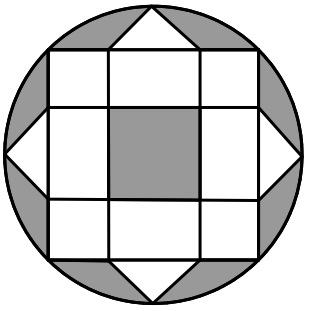
A. 120 B. 150 C. 180 D. 210 E. 240

9 As shown in the figure below, in triangle ABC, $AD = DF = FB$, and $AE = EG = GC$, The ratio of the area of $DEGF$ to the area of $FGCB$ is _____ .



A. $1:2$ B. $3:5$ C. $4:5$ D. $4:9$ E. $3:8$

10 As shown in the figure below, given that the radius of the large circle is 20 and each point on the circle is an octagonal point, find the area of the shaded rigion. (Use 3.14 for π)

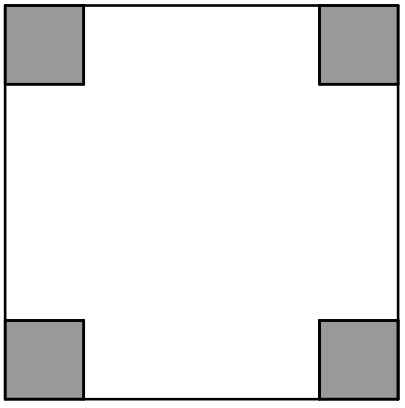


A. 314 B. 400 C. 450 D. 456 E. 471

11 If the proper fractions $\frac{A}{21}$, $\frac{B}{35}$, and $\frac{C}{45}$ are in lowest terms, and the product of the three fractions is $\frac{1}{105}$, then the value of $\frac{A}{21}+\frac{B}{35}+\frac{C}{45}$ is _____ .

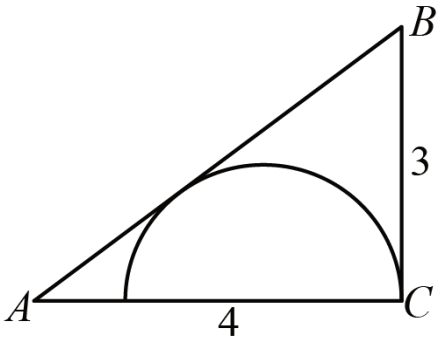
A. $\frac{16}{21}$ B. $\frac{41}{63}$ C. $\frac{94}{105}$ D. $\frac{96}{135}$ E. $\frac{61}{189}$

12 A square with the side length of 2 inch is cut from the corners of a square with the side length of 10 inch. What is the area in square inches of the largest square that can be fitted into the remaining space?



A. 36 B. 48 C. 60 D. 64 E. 72

13 In right triangle ABC, $AC = 4$, $BC = 3$, and $\angle C$ is right angle. A semicircle is inscribed in the triangle as shown. What is the radius of the semicircle?

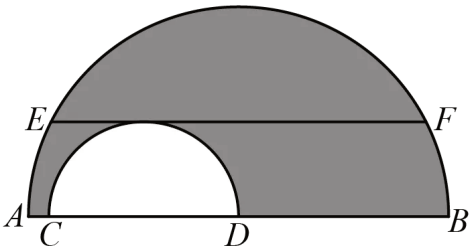


A. 1 B. 1.2 C. 1.5 D. 1.8 E. 2

14 Bowen wrote the first 2021 positive integers on a blackboard, then erased all the multiples of 2, then all the multiples of 5. How many integers were still there? ( ) .

A. 607 B. 708 C. 809 D. 985 E. 1002

15 As shown in the figure, the diameter CD of the small semicircle is on the diameter AB of the big semicircle. Line EF which is parallel to line AB is tangent to the small semicircle. If $AB = 10$ cm and $EF = 8$ cm, then what's the ratio of the area of the blank part to that of the shaded part? (π approximates to 3.14)



A. $4 : 5$ B. $3 : 5$ C. $16 : 25$ D. $16 : 25$ E. $9 : 16$

16 There are 5 coins on the table. Two coins each worth 100 cents, two coins each worth 50 cents, and one coin worths 5 cents. How many different total values of coins can be made with these coins? (Example: one 100 cents coin, one 50 cents coin, and one 5 cents coin can form a group.)

A. 16 B. 15 C. 14 D. 13 E. 12

17 How many numbers between 1 and 2021 are integer multiples of 3 or 4, but not 12?

A. 505 B. 673 C. 842 D. 1010 E. 1178

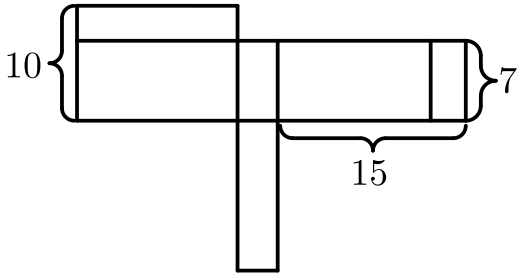
18 Given that $a, b,$ and c are all positive integers and $a+b+c=12$, there are _____ numbers $\overline{abc}$ that satisfy the condition. ($a, b,$ and c can be the same number)

A. 52 B. 53 C. 54 D. 55 E. 66

19 The possible scores one can get in the AIME test is an integer from 0 to 15. 100 students in one school took the test and the mode is 0. If the mode is unique, at least how many students got a 0? (Hint: the mode is the value that appears most frequently in a series of numbers.)

A. 5 B. 6 C. 7 D. 8 E. 9

20 The following shows the net of a cuboid carton. The volume of the cuboid carton is _____ .

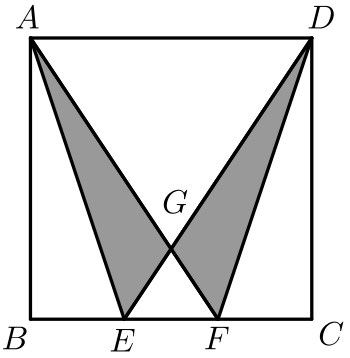


A. 252 B. 288 C. 240 D. 216 E. 192

21 If we divide a natural number by 5, the remainder is 2. If we divide it by 8, the remainder is 3. The sum of all possible choices of this natural number less than 150 is _____ .

A. 27 B. 147 C. 174 D. 241 E. 348

22 The area of square $ABCD$ is 30 square centimeters. Given that $BE = EF = FC$, find the total area of the shaded parts.



A. 7 cm^2 B. 7.5 cm^2 C. 8 cm^2 D. 8.5 cm^2 E. 9 cm^2

23 There are 300 grams of an 10% sugar solution in bottle A and 600 grams of a 40% sugar solution in bottle B. How many grams of solution should be exchanged between bottle A and B to make them have the same sugar concentration?

A. 200 B. 210 C. 240 D. 250 E. 300

24 There is a deck of cards containing Jokers (red Joker and black Joker). We should take at least _____ cards to make sure that there are two cards that have the same suit.

A. 5 B. 7 C. 12 D. 40 E. 43

25 When a number is divided by 2, 3, 4, 5, 6, 7 and 8 respectively, the remainders are all different non-zero numbers. How many four-digit numbers meet this condition?

A. 8 B. 9 C. 10 D. 11 E. 12

26 There is a series of numbers, $\frac{1}{1}, \frac{1}{2}, \frac{2}{2}, \frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{3}{3}, \frac{2}{3}, \frac{1}{3}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{4}{4}, \frac{3}{4}, \frac{2}{4}, \frac{1}{4}, \cdots\cdots$. The _____ th number is $\frac{20}{21}$ (If you find more than 1 answers, choose the one appears in the answer choices).

A. 385 B. 400 C. 399 D. 420 E. 440

27 There are 30 cards in the pocket, which are written with $1, 2, 3, \cdots, 30$ respectively. James randomly selects one of them. What is the probability that the number on the selected card is not a prime number?

A. $\frac{3}{10}$ B. $\frac{1}{3}$ C. $\frac{7}{10}$ D. $\frac{19}{30}$ E. $\frac{2}{3}$

28 How many four-digit whole numbers are there such that they are formed by four different even digits and each number's ones digit is greater than its thousands digit?

A. 36 B. 48 C. 54 D. 60 E. 90

29 How many positive integers N are there so that $\frac{N+2021}{N+5}$ is a positive integer?

A. 32 B. 33 C. 34 D. 35 E. 36

30 A, B and C start walking around the circular track from the same place and toward the same direction at the same time. A, B, and C need 4 minutes, 10 minutes, and 16 minutes to walk around the circular track, respectively. After how many seconds will the three people arrive at the same place for the first time?

A. 1200 seconds B. 1400 seconds C. 1500 seconds D. 1600 seconds
E. 1800 seconds

31 There are eight students A, B, C, D, E, F, G and H queuing in a row. If A and B, C and D, E and F, and G and H must be adjacent, and A doesn't stand in the first place or the last place, how many different arrangements meet the requirement?

A. 240 B. 264 C. 288 D. 324 E. 336

32 Let X, Y, Z and W be four different numbers selected from the set $\{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$.
If the sum $\frac{W}{X} + \frac{Y}{Z}$ is to be as small as possible, then $\frac{W}{X} + \frac{Y}{Z}$ is equal to _____ .

A. $\frac{13}{30}$ B. $\frac{14}{45}$ C. $\frac{15}{56}$ D. $\frac{17}{72}$ E. $\frac{29}{90}$

33 How many four-digit numbers with no repeating digits can be made using digits among $0, 2, 3, 5, 6,$ and 8?

A. 120 B. 270 C. 288 D. 300 E. 360

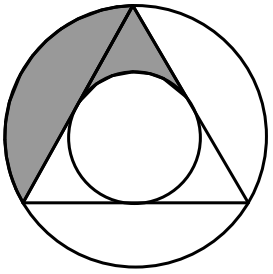
34 Two distinct numbers are selected randomly from 0 to 9, inclusively. Find the probability that the difference between the two numbers is 2.

A. $\frac{8}{41}$ B. $\frac{7}{45}$ C. $\frac{7}{41}$ D. $\frac{8}{45}$ E. $\frac{9}{41}$

35 How many positive integers N are there such that $\dfrac{N+2021}{N+5}$ is a positive integer?

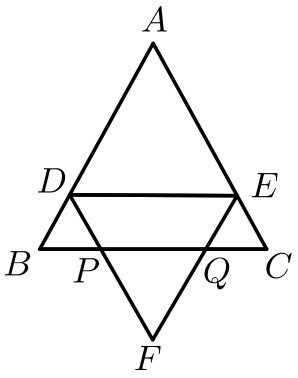
A. 32 B. 33 C. 34 D. 35 E. 36

36 In the figure shown below, there is a equilateral triangle, its inscribed circle, and its circumcircle. The radius of the large circle is twice that of the small circle. The area of the inscribed circle is 30 cm^2. The area of the shaded region is _____ . ($\pi \approx 3$)



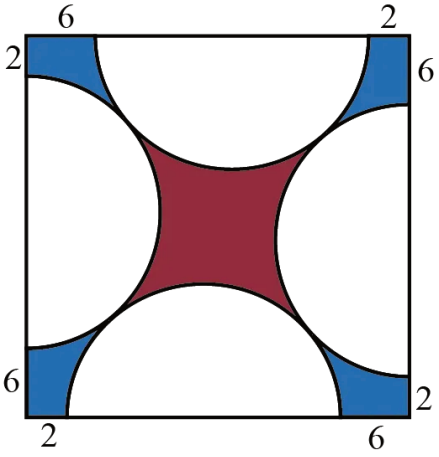
A. 20 cm^2 B. 30 cm^2 C. 40 cm^2 D. 50 cm^2 E. 60 cm^2

37 As shown in the figure below, in $\triangle ABC$, $DE//BC$, $DF//AC$, $EF//AB$. The area of $\triangle PQF$ is 54, and the area of $\triangle ADE$ is 96. Find the area of $\triangle ABC$.



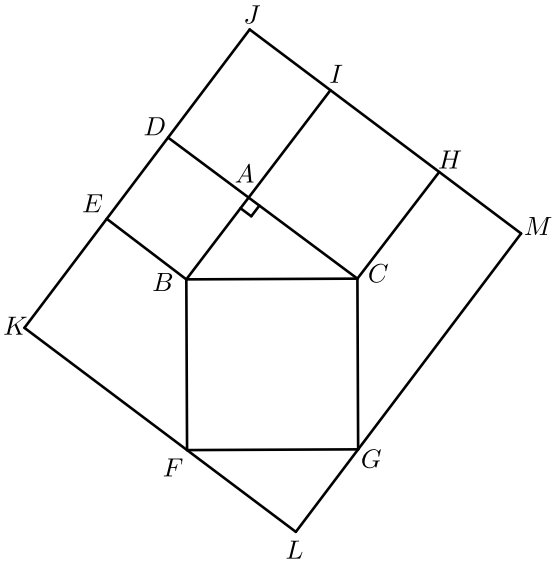
A. 142 B. 144 C. 148 D. 150 E. 156

38 As shown in the figure below, there are exactly four identical semicircles in a square, and the diameter of each semicircle is on the side of the square. The lengths of some line segments are shown in the figure. What is the difference between the area of the shaded region in the center (the red part) and that of the shaded regions in the four corners (the blue parts)?



A. 12 B. 16 C. 18 D. 20 E. 24

39 As shown in the figure below, in right triangle ABC, $AB = 3$, and $AC = 4$. Points D, E, F, G, H, and I are on the rectangle $KLMJ$. If quadrilateral $ABED$, $ACHI$, and $BCGF$ are square, then the area of $KLMJ$ is _____ .



A. 100 B. 110 C. 120 D. 150 E. 180

40 Six children including Tom and Jerry are playing games on the playground. They are divided into three groups by the teacher, and there are two children in each group. What's the probability that Tom and Jerry are in the same group?

A. $\frac{1}{5}$ B. $\frac{1}{6}$ C. $\frac{1}{15}$ D. $\frac{1}{10}$ E. $\frac{4}{15}$

NOTE

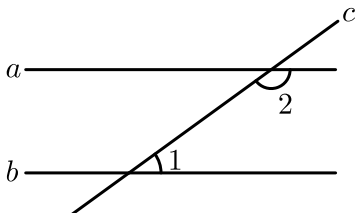
NOTE

Think cup

1 If a and b are the two real roots of the equation $x^2 - 2x - 1 = 0$, then $(a - b)(a + b - 2) + ab =$ _____ .

A. -2 B. -1 C. 0 D. 1 E. 2

2 As shown in the figure below, $a \parallel b$. If $m\angle 2 = 4m\angle 1$, then $m\angle 1$ is _____ .



A. 30° B. 36° C. 40° D. 45° E. 42°

3 The sum of 8 and six times a number equals the sum of 4 and eight times this number. The value of this number is _____ .

A. 1 B. 2 C. 3 D. 4 E. 5

4 John's age is greater than 68 and smaller than 73 and his age is an even number. Then John could be _____ years or _____ years old this year.

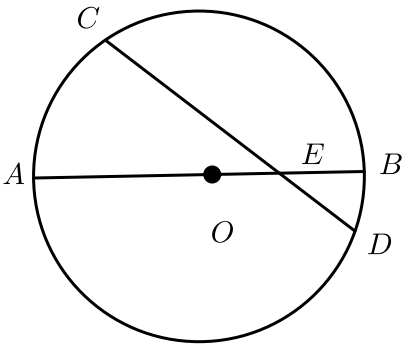
A. 68; 70 B. 69; 70 C. 70; 71 D. 71; 72 E. 70; 72

5 Rationalize the denominator: $\frac{1}{1+\sqrt{2}-\sqrt{3}} =$ _____ .

A. $\frac{1+\sqrt{2}+\sqrt{3}}{4}$ B. $\frac{1+\sqrt{2}+\sqrt{3}}{2}$ C. $\frac{\sqrt{2}+2+\sqrt{6}}{4}$ D. $\frac{\sqrt{2}-2+\sqrt{6}}{4}$

E. $\frac{2\sqrt{2}-2+\sqrt{6}}{4}$

6 As the figure shown below, $\overline{AB}$ is the diameter of $\odot O$ and intersects with $\overline{CD}$ at point E. $AE = 6$ cm, $EB = 2$ cm and $m\angle BED = 30°$. The length of $\overline{CD}$ is _____ cm.



A. $\sqrt{15}$ B. $2\sqrt{15}$ C. $\sqrt{17}$ D. $2\sqrt{17}$ E. 8

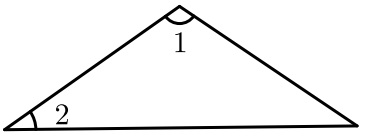
7 If the ratio of men to women at a party is $3 : 5$, which of the following could be the number of people at the party?

A. 31 B. 32 C. 33 D. 34 E. 35

8 Tiara can make 120 cookies using 20 grams of butter. How many grams of butter does Tiara need to make 60 cookies?

A. 5 B. 8 C. 10 D. 12 E. 15

9 In the figure, the triangle is an isosceles triangle, $m\angle 1 = 110°$. $m\angle 2 =$ _____ .



A. $35°$ B. $70°$ C. $110°$ D. $55°$ E. $45°$

10 When 60, 154, and 200 are divided by a number, the remainders are $a - 1$, a^2, and $a^3 - 1$, respectively. Then the sum of digits of this number is _____ .

A. 11 B. 15 C. 9 D. 17 E. 13

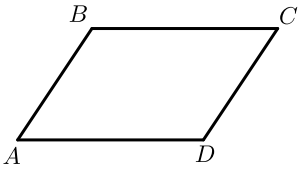
11 A tiny bug is on the origin of a number line. It first moves 2 units to the right, and then moves 6 units to the left. Then the number on its final position is _____ .

A. 6 B. -2 C. 4 D. 2 E. -4

12 The sum of a polynomial and $x^2 - 2x + 1$ is $3x - 2$, then the polynomial is _____ .

A. $x^2 - 5x + 3$ B. $-x^2 + x - 1$ C. $-x^2 + 5x - 3$ D. $x^2 - 5x - 13$
E. $x^2 + 5x + 3$

13 In parallelogram $ABCD$, $m\angle B + m\angle D = 260^\circ$, then $m\angle A$ is _____ .



A. 130° B. 100° C. 50° D. 65° E. 80°

14 If x and y satisfy the system of linear equations $\begin{cases} 427x + 356y = 213 \\ 573x + 144y = 1287 \end{cases}$, then the value of $x^2 + 3x^2y + y^2$ is _____ .

A. -9 B. -27 C. -63 D. 45 E. 99

15 If the value of polynomial $2x^2 + 3x + 4$ is 11, then the value of $8x^2 + 12x - 5$ is _____ .

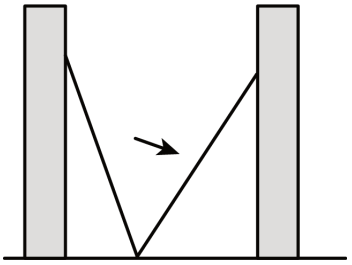
A. 20 B. 21 C. 22 D. 23 E. 24

16 Solve the absolute value inequality $|x - 2| \leqslant 1$.

A. $1 \leqslant x \leqslant 3$ B. $-1 \leqslant x \leqslant 3$ C. $-3 \leqslant x \leqslant -1$ D. $-1 \leqslant x \leqslant 1$

E. $-3 \leqslant x \leqslant 3$

17 As shown in the figure, there are two walls on the two sides of the alley. When a ladder leans against the left wall, the distance from the bottom of the ladder to the left corner of the wall is 0.7 meters, and the top of the ladder is 2.4 meters away from the ground. If the bottom position of the ladder is unchanged, and the ladder is changed to lean against the right wall, the top of the ladder is 2 meters away from the ground. Then the width of the alley is _____ .



A. 0.7 meters B. 1.5 meters C. 2.2 meters D. 2.4 meters
E. 2.25 meters

18 Four friends have a total of 12 identical pencils, and each one has at least two pencils. How many ways are there to divide these pencils?

A. 32 B. 33 C. 34 D. 35 E. 36

19 Suppose that real numbers a and b satisfy $\sqrt{a-2022}+\sqrt{2022-a}=b$. What is the value of $a+b$?

A. -2022 B. 4044 C. 0 D. 2022 E. -4044

20 Calculate: $\frac{6}{5}\times 1\frac{17}{18}=$ _____ .

A. $\frac{3}{7}$ B. $\frac{2}{3}$ C. $\frac{5}{3}$ D. $\frac{7}{3}$ E. $\frac{17}{15}$

NOTE

NOTE

AMC 10 Mock

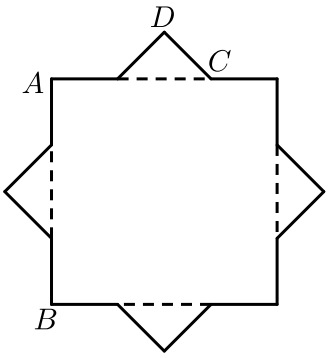
1 Suppose a and b are positive integers such that $\frac{1}{a}-\frac{1}{b}=\frac{1}{2021}$, then the number of pairs (a,b) is ( ) .

A. 2020 B. 2021 C. 3 D. 4 E. 5

2 Ming spent $\$1$ while walking in the first shop, spent the half of the remaining money in the shop, and spent another $\$1$ while walking out the shop. He then spent $\$1$ while walking in the second shop, spent the half of the remaining money in the shop, and spent another $\$1$ while walking out the shop. He did the exact same things while walking in the third and the fourth shop. After he left the fourth shop, he only got $\$1$ left over. How much money did he have before walking in the first shop?

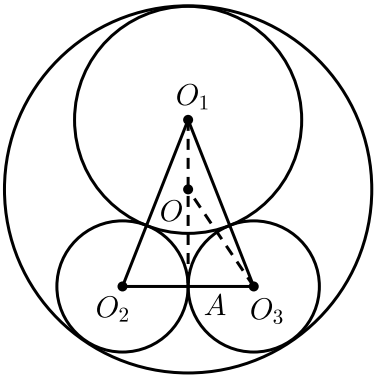
A. 5 B. 13 C. 29 D. 61 E. 125

3 The following figure is an octagonal star made by 2 overlapping congruent squares. The octagonal star has 8 right angles, 8 identical obtuse angles, and equal sides. If the length of AB is $4+2\sqrt{2}$ (the side length of the original square), the length of CD (the side length of the octagonal star) is?



A. $\sqrt{2}$ B. 2 C. $2\sqrt{2}$ D. 4 E. $\sqrt{3}$

4 Place two circles with radius 5 and a circle with radius 8 on the desktop such that they are pairwise circumscribed. If there is a larger circle covering all the the three circles completely, then the least radius of the larger circle is _____ .



A. 12 B. $8\sqrt{2}$ C. $8\sqrt{3}$ D. $\frac{40}{3}$ E. 18

5 A, B, C and D, four students, sit in a row and next to each other. They are each assigned a seat number, from 1 to 4, respectively. A person who always lies says, "B is sitting next to C; A is sitting between B and C; and B's seat number is not 3." Whose seat number is 2?

A. A B. B C. C D. D E. Not sure

6 Bob and Tom went shopping. Bob spent 10 more dollars than 3 times Tom. They spent 110 dollars in total. How much did each spend?

A. Tom: 25 dollars; Bob: 75 dollars B. Tom: 25 dollars; Bob: 85 dollars

C. Tom: 30 dollars; Bob: 85 dollars D. Tom: 30 dollars; Bob: 105 dollars

E. Tom: 35 dollars; Bob: 75 dollars

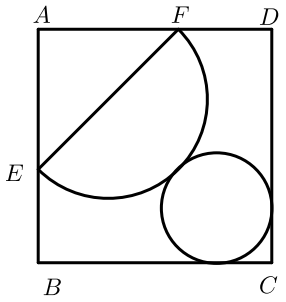
7 The factorial (denoted as M!) for a positive number M is the product of all the positive numbers preceding from 1 to M. Then, there are ( ) 0s at the end of the result of $98! + 99! + 100!$.

A. 23 B. 24 C. 25 D. 26 E. 27

8 Arrange the consecutive positive integers 1, 2, $\cdots$, n ($n \in \mathbf{N}_+$) in an increasing order to construct a number $123\cdots n$. (For example, when $n = 12$, the number is 123456789101112, which contains 15 digits). Randomly pick a digit from this number, and suppose $p(n)$ is the probability that 0 is picked, then $p(2021)$ is ( ) .

A. $\frac{458}{6977}$ B. $\frac{524}{6977}$ C. $\frac{533}{6977}$ D. $\frac{553}{6977}$ E. $\frac{618}{6977}$

9 In square $ABCD$ with side length 2, E and F are the midpoints on AB and AD, respectively. Draw a semicircle with side length EF, if there exists another circle circumscribed with this semicircle, sides CB and CD. What is the radius of this circle?



A. $\frac{1}{2}$ B. $\frac{\sqrt{2}}{2}$ C. $\frac{3\sqrt{2}}{2}-2$ D. $2-\sqrt{2}$ E. $2-\frac{\sqrt{3}}{2}$

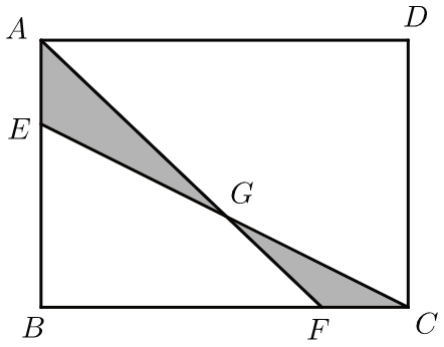
10 If there are 10 factors for a natural number n, 20 factors for $2n$ and 15 factors for the $3n$, then there are _____ factors for $6n$.

A. 24 B. 25 C. 30 D. 35 E. 36

11 The coefficient of x^{150} in the expansion (after combining like terms) of $\left(1+x+x^2+\cdots+x^{100}\right)^3$ is _____ .

A. 7431 B. 7651 C. 7653 D. 7831 E. 8315

12 Points E and F are on side AB and BC of rectangle $ABCD$ such that $AE=\frac{1}{3}AB$ and $CF=\frac{1}{4}BC$. AF and CE intersect at G. If the area of $ABCD$ is 120, then the sum of $\triangle AEG$ and $\triangle CGF$ is _____ .



A. 14 B. 15 C. 16 D. 17 E. 18

13 There are two operations for a number: ① double it; ② increase it by 1. At least _____ steps of the above two operations could change number 1 to 2015.

A. 18 B. 19 C. 20 D. 21 E. 22

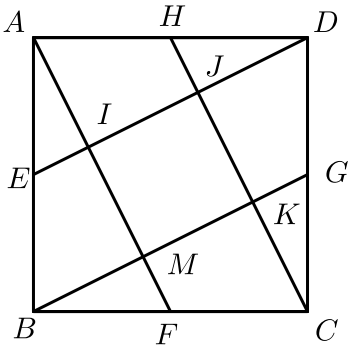
14 The real solution of $x^{[x]}=\frac{9}{2}$ is _____ .

A. $2\frac{\sqrt{2}}{2}$ B. 3 C. $\frac{2\sqrt{3}}{3}$ D. $2\sqrt{2}$ E. $\frac{3\sqrt{2}}{2}$

15 There is a set of numbers ordered from smallest to largest : 2 , 5 , x , y , $2x$, 11. The average and the median of them are both 7, so that the mode of this set of numbers is _____ .

A. 2 B. 3 C. 5 D. 7 E. 11

16 In the $ABCD$ with the side length 5, E, F, G and H are the midpoints on the sides, and I, J, K and M are the midpoints of AM, DI, CJ and BK, respectively. The quadrilateral $IJKM$ is also a square. What is the area of $IJKM$?



A. 4 B. $3\sqrt{3}$ C. 5 D. $4\sqrt{2}$ E. 6

17 Three distinct points A, B and C are randomly chosen on a unit circle, then the probablity that $\triangle ABC$ is acute is _____ .

A. $\frac{1}{2}$ B. $\frac{1}{3}$ C. $\frac{1}{4}$ D. $\frac{2}{5}$ E. $\frac{1}{6}$

18 A robot is initially at the origin of a coordinate system, and it moves following this rule: everytime it moves one unit, and the direction is either up or right, and the probabilities of moving up and moving to the right are both $\frac{1}{2}$. Then after 5 movements, the probabilty that the robot ends at point $(3,2)$ is ( ) .

A. $\frac{5}{8}$ B. $\frac{1}{32}$ C. $\frac{5}{32}$ D. $\frac{5}{16}$ E. $\frac{3}{64}$

19 Dennis lives in a house on Think Street. The house numbers on this street go as 1, 2, 3⋯ until the end of the street. The difference between Dennis' house number and the sum of all the house numbers on the street is 265. Then, there are _____ houses on the street and Dennis' house number is _____ .

A. 23, 11 B. 24, 12 C. 25, 13 D. 26, 14 E. 27, 15

20 In a number sequence $\{a_n\}$, $a_1 = 2, a_2 = 10$. For all positive integers n, there is $a_{n+2} = a_{n+1} - a_n$, then $a_{2021} =$ _____

A. -10 B. -2 C. 0 D. 2 E. 10

21 Point $P(1,-2)$ and P_1 are symmetric with respect to x axis. Point P_1 and P_2 are symmetric with respect to y axis. What are the coordinates of P_2?

A. $(1,-2)$ B. $(-1,2)$ C. $(-1,-2)$ D. $(-2,-1)$ E. $(1,2)$

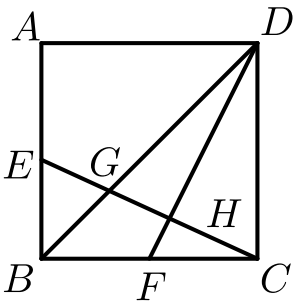
22 Suppose a, b, and c are three positive integers satisfying $a>b>c$. $LCM(a,b)=300$, $GCD(a,c)=GCD(b,c)=20$. The number of such a group (a,b,c) is _____.

A. 3 B. 4 C. 5 D. 6 E. 7

23 Define $a\#b=a+b-ab\div 910$, then $2021\#2020\#2019\#2018\cdots\cdots\#3\#2\#1=$ _____.

A. 0 B. 1 C. 910 D. 2021 E. $6783\frac{2020}{2021}$

24 The area of the square $ABCD$ is 60. E is the midpoint of AB and F is the midpoint of BC, then $EG : GH : HC =$ _____ .



A. $5 : 4 : 6$ B. $6 : 5 : 7$ C. $7 : 5 : 8$ D. $4 : 5 : 3$ E. $12 : 9 : 14$

25 A positive integer is written on each face of a cube. If each vertex of this cube is marked with the product of the integers on three adjacent faces, and the sum of all the numbers on the vertices is 1001, what is the sum of all the integers on the faces?

A. 30 B. 31 C. 32 D. 33 E. 35

NOTE

NOTE

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