

~~11~~
The volume of right circular cylinder A is 22 cubic centimeters. What is the volume, in cubic centimeters, of a right circular cylinder with twice the radius and half the height of cylinder A?

- A) 11
B) 22
C) 44
D) 66

$$V = \pi r^2 h \rightarrow 2r = \pi r^2 h$$

$$\pi (2r)^2 \left(\frac{1}{2}\right)h$$

$$4\pi r^2 \left(\frac{1}{2}\right)h$$

$$2\pi r^2 h$$

$$\text{So } \dots \\ \frac{2(\pi r^2 h)}{2(22)}$$

44

~~12~~
Which of the following is equivalent to $9^{3/4}$?

- A) $\sqrt[3]{9}$
B) $\sqrt[3]{9}$
C) $\sqrt{3}$
D) $3\sqrt{3}$

$$9^{3/4} = 3^{(2 \cdot 3/4)}$$

$$3^{6/4}$$

$$3^{3/2}$$

$$\sqrt{3^3}$$

and

$$\sqrt[2]{3^3} = 3\sqrt{3}$$

~~13~~ ~~don't understand!~~
At a restaurant, n cups of tea are made by adding t tea bags to hot water. If $t = n + 2$, how many additional tea bags are needed to make each additional cup of tea?

- A) None
B) One
C) Two
D) Three

when n is (\uparrow) by 1,
increases by the
coefficient of n ,
which is 1

Page 42; Q11

Vol. of Right circular cylinder A
= 22 cubic cm.

$$\pi r^2 h = 22 \quad \text{--- eq. (1)}$$

$$\pi (2r)^2 \left(\frac{h}{2}\right)$$

$$= \pi (4r^2) \frac{h}{2}$$

$$= \underbrace{\pi (r^2) h}_{22} \frac{(4)}{(2)}$$

~~#~~ ↓

$$= (22) \left(\frac{4}{2}\right)$$

$$= 44 \text{ cubic cm}$$

$$= \boxed{44 \text{ cm}^3} \text{ ANS.}$$

Page 42; Q12

$$9^{3/4} \rightarrow (9^{1/4})^3$$
$$= (9^3)^{1/4} \text{ or } (3^{1/2})^3$$
$$(\sqrt{3})^3$$
$$\boxed{3\sqrt{3}} \text{ ANS.}$$

Page 42; Q13

'n' cups of tea are made from 't' tea bags.

~~1/2~~ 't' tea bags give 'n' cups.

$$\frac{\cancel{t}}{\cancel{t}} \text{ tea bag} \rightarrow \frac{n}{t} \text{ cups.}$$

$$1 \text{ tea bag} \rightarrow \frac{n}{t} \text{ cups.}$$

$$(n+2)(1) \rightarrow \frac{n(n+2)}{t} \text{ cups of tea}$$

Question Not clear.

3



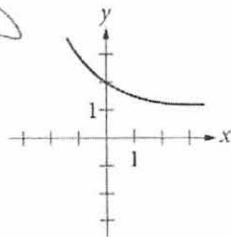
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14

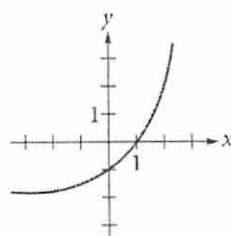
$$f(x) = 2^x + 1$$

The function f is defined by the equation above. Which of the following is the graph of $y = -f(x)$ in the xy -plane?

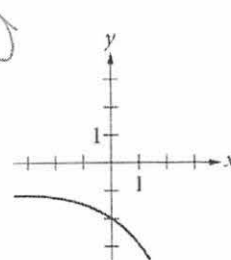
A)



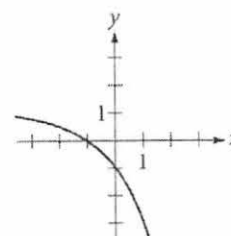
B)



C)



D)



15

Alan drives an average of 100 miles each week. His car can travel an average of 25 miles per gallon of gasoline. Alan would like to reduce his weekly expenditure on gasoline by \$5. Assuming gasoline costs \$4 per gallon, which equation can Alan use to determine how many fewer average miles, m , he should drive each week?

A) $\frac{25}{4}m = 95$

B) $\frac{25}{4}m = 5$

C) $\frac{4}{25}m = 95$

D) $\frac{4}{25}m = 5$

$\frac{25 \text{ mi}}{\text{gallon}} \times \frac{1 \text{ gallon}}{\$4} \times \text{---}$

$\frac{25}{4}(x) = 5$

3



3

GIVEN.

- → TOTAL DISTANCE = 100 miles per week on average
- → CAR GIVES 25 miles/gallon of gasoline
- ALAN would like to reduce his weekly expenditure by \$5
- GASOLINE COSTS = \$4/gallon.

$$\$4 \xrightarrow{\text{takes him}} 25 \text{ miles}$$

$$\therefore \frac{\$4}{4} \rightarrow \frac{25}{4} \text{ miles/\$ of gasoline.}$$

$$\therefore \frac{100}{\left(\frac{25}{4}\right)} = \text{EXPENSES PER WEEK} = 100 \times \left(\frac{4}{25}\right)$$

Expenses per week in \$

Now to reduce his expenses by \$5 per week he will have to drive "fewer miles"

$$\therefore \text{EXPENSES PER WEEK} - \$5 = (\text{fewer miles}) \left(\frac{4}{25}\right)$$

$$\Rightarrow 100 \left(\frac{4}{25}\right) - \$5 = (100 - m) \left(\frac{4}{25}\right)$$

$$\Rightarrow (100) \left(\frac{4}{25}\right) - \$5 = (100) \left(\frac{4}{25}\right) - m \left(\frac{4}{25}\right)$$

$$\Rightarrow -\$5 = -m \left(\frac{4}{25}\right)$$

$$\Rightarrow \text{ANSWER} \quad \left| \begin{array}{l} \$5 = m \left(\frac{4}{25}\right) \end{array} \right|$$

3



3

19

$$\frac{2x+6}{(x+2)^2} - \frac{2}{x+2}$$

The expression above is equivalent to $\frac{a}{(x+2)^2}$,

where a is a positive constant and $x \neq -2$.

What is the value of a ?

$$(x^2) \frac{2x+6}{(x)^2} - \frac{2}{x} = \frac{a}{(x)^2} (x)^2$$

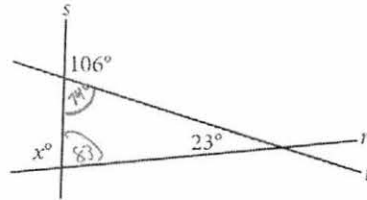
$$2x+6 - 2x = a$$

$$\boxed{6 = a}$$

$$a = 6$$

20

Intersecting lines r , s , and t are shown below.



What is the value of x ?

$$74 + 23$$

$$97$$

$$180 - 97$$

$$83$$

$$180 - 83$$

$$\boxed{97}$$

STOP

If you finish before time is called, you may check your work on this section only.

Do not turn to any other section.

$$\frac{2x+6}{(x+2)^2} - \frac{2}{(x+2)} = \frac{a}{(x+2)^2}$$

$$\frac{2x+6}{(x+2)^2} - \frac{a}{(x+2)^2} = \frac{2}{(x+2)}$$

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

$$\Rightarrow \{2x+6-a\} = \frac{2(x+2)^2}{(x+2)}$$

$$\Rightarrow 2x+6-a = 2(x+2)$$

$$\Rightarrow \cancel{2x} + 6 - a = \cancel{2x} + 4$$

$$\Rightarrow -a = -2$$

$$\Rightarrow a = 2$$

ANS.

$$x^\circ = 74^\circ + 23^\circ$$

$$x^\circ = 97^\circ$$

$$x = 97 \text{ ANS.}$$

14

Type of surgeon	Major professional activity		Total
	Teaching	Research	
General	258	156	414
Orthopedic	119	74	193
Total	377	230	607

In a survey, 607 general surgeons and orthopedic surgeons indicated their major professional activity. The results are summarized in the table above. If one of the surgeons is selected at random, which of the following is closest to the probability that the selected surgeon is an orthopedic surgeon whose indicated professional activity is research?

- A) 0.122
 B) 0.196
 C) 0.318
 D) 0.379

$$\frac{74}{193} = .38$$

read!
carefully!



$$\frac{74}{607} = 0.122 \quad \text{ANSWER A}$$

607

"IF ONE OF THE FORGONES" IS
SELECTED AT RANDOM.

FIVE STAR.

FIVE STAR.

FIVE STAR.

FIVE STAR.



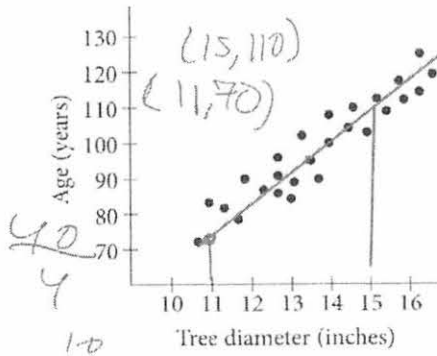
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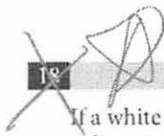
17

Tree Diameter versus Age



The scatterplot above gives the tree diameter plotted against age for 26 trees of a single species. The growth factor of this species is closest to that of which of the following species of tree?

- A) Red maple
- B) Cottonwood
- C) White birch
- D) Shagbark hickory



If a white birch tree and a pin oak tree each now have a diameter of 1 foot, which of the following will be closest to the difference, in inches, of their diameters 10 years from now? (1 foot = 12 inches)

- A) 1.0 $12 = 5c$ $12 = 3c$
- B) 1.2
- C) 1.3 $2.4c$ $4 = c$
- D) 1.4

C



NEED ADDITIONAL INFO.



FIVE STAR.

FIVE STAR.



FIVE STAR.

FIVE STAR.

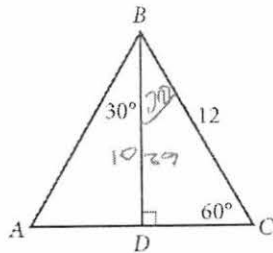


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4

19



In $\triangle ABC$ above, what is the length of \overline{AD} ?

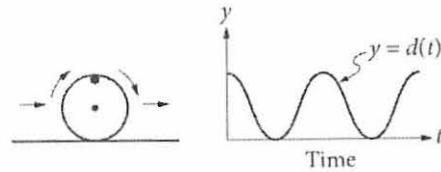
- A) 4
 B) 6
 C) $6\sqrt{2}$
 D) $6\sqrt{3}$

$$\frac{\sin 60}{x} = \frac{\sin 90}{12}$$

$$\frac{\sin 30}{x} = \frac{\sin 90}{12}$$

20

read explanation



The figure on the left above shows a wheel with a mark on its rim. The wheel is rolling on the ground at a constant rate along a level straight path from a starting point to an ending point. The graph of $y = d(t)$ on the right could represent which of the following as a function of time from when the wheel began to roll?

- A) The speed at which the wheel is rolling
 B) The distance of the wheel from its starting point
 C) The distance of the mark on the rim from the center of the wheel
 D) The distance of the mark on the rim from the ground

BASED ON GIVEN INFORMATION
 $12 \sin 60^\circ = BD$

$$\tan 30^\circ = \frac{AD}{BD}$$

$$AD = (BD) \tan 30^\circ$$

$$= 12 (\sin 60^\circ) (\tan 30^\circ)$$

$$= (12) (0.866) (0.577)$$

$$= 12 (0.5)$$

your

AD	=	6
----	---	---

ANSWER

- (A) No, because speed is constant "GIVEN"
 (B) No, because distance will keep on increasing
 (C) No, because that distance is constant,
 (D) YES, ←

ANSWER

~~26~~ ~~A~~ go over!

A psychologist set up an experiment to study the tendency of a person to select the first item when presented with a series of items. In the experiment, 300 people were presented with a set of five pictures arranged in random order. Each person was asked to choose the most appealing picture. Of the first 150 participants, 36 chose the first picture in the set. Among the remaining 150 participants, p people chose the first picture in the set. If more than 20% of all participants chose the first picture in the set, which of the following inequalities best describes the possible values of p ?

- A) $p > 0.20(300 - 36)$, where $p \leq 150$
- B) $p > 0.20(300 + 36)$, where $p \leq 150$
- C) $p - 36 > 0.20(300)$, where $p \leq 150$
- D) $p + 36 > 0.20(300)$, where $p \leq 150$

$$\frac{36}{150} = \frac{24}{100} = 24\%$$

D

~~26~~ go over! find efficient way to do

The surface area of a cube is $6\left(\frac{a}{4}\right)^2$, where a is a positive constant. Which of the following gives the perimeter of one face of the cube?

- A) $\frac{a}{4}$
- B) a
- C) $4a$
- D) $6a$

$$S^2 = 6\left(\frac{a}{4}\right)^2$$

$$S = 6\left(\frac{a}{4}\right)$$

$$S = \frac{3}{2}a$$

$$\frac{3}{2} \times \frac{2}{1} a$$

$$6a$$

B

~~27~~ ~~A~~

The mean score of 8 players in a basketball game was 14.5 points. If the highest individual score is removed, the mean score of the remaining 7 players becomes 12 points. What was the highest score?

- A) 20
- B) 24
- C) 32
- D) 36

$$\frac{12 + x}{8} = 14.5$$

$$12 + x = 116$$

$$-12 \quad -12$$

$$x = 104$$

$$14.5 - x = 0$$

$$+x + x$$

$$2.5x$$

C



SURFACE AREA OF CUBE = $6 \left(\frac{a}{4}\right)^2$

∴ SURFACE AREA OF ONE SIDE = $\left(\frac{a}{4}\right)^2$

∴ length of one edge = $\left(\frac{a}{4}\right)$

∴ the perimeter of the one face =

= $4 \times (\text{length of one edge})$

= $(4) \times \left(\frac{a}{4}\right)$

= a = ANSWER

Mean = $\frac{n_1 + n_2 + n_3 + \dots + n_8}{8}$

⇒ $14.5 = \frac{n_1 + \dots + n_8}{8}$

⇒ $(14.5)(8) = n_1 + n_2 + \dots + n_7 + n_8$

eq ①

eq. ① - eq ②

⇒ $116 = (n_1 + n_2 + \dots + n_7) + n_8$ — eq ①

(-) $84 = (-)(n_1 + n_2 + \dots + n_7)$ — eq ②

32 = n₈ ANSWER.

$12 = \frac{n_1 + n_2 + \dots + n_7}{7}$

⇒ $(12)(7) = n_1 + n_2 + \dots + n_7$

eq ②

$84 = n_1 + n_2 + \dots + n_7$

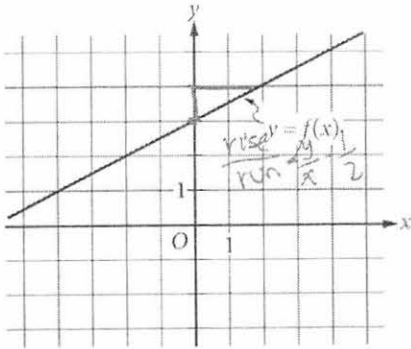
eq ②

4



4

28



The graph of the linear function f is shown in the xy -plane above. The slope of the graph of the linear function g is 4 times the slope of the graph of f . If the graph of g passes through the point $(0, -4)$, what is the value of $g(9)$?

- A) 5
- B) 9
- C) 14
- D) 18

$\frac{1}{2} \times 4$
 $y = 2x - 4$
 $2(9) - 4$

29

~~29~~ go over!
 $x^2 + 20x + y^2 + 16y = -20$

The equation above defines a circle in the xy -plane. What are the coordinates of the center of the circle?

- A) $(-20, -16)$ $x(x+20) + y(y+16) = -20$
- B) $(-10, -8)$ \times
- C) $(10, 8)$
- D) $(20, 16)$ $-20, -16$

how to find coordinates for center of circle

B

30

$$y = x^2 - a$$

In the equation above, a is a positive constant and the graph of the equation in the xy -plane is a parabola. Which of the following is an equivalent form of the equation?

- A) $y = (x+a)(x-a)$
- B) $y = (x + \sqrt{a})(x - \sqrt{a})$
- C) $y = \left(x + \frac{a}{2}\right)\left(x - \frac{a}{2}\right)$
- D) $y = (x+a)^2$

$$y = mx + b$$

$$= \frac{\text{rise}}{\text{run}} x + b$$

$$y = \frac{1}{2} x + b$$

$$(3) = \left(\frac{1}{2}\right)(0) + b$$

$$\Rightarrow \boxed{b = \left(\frac{5}{2}\right)}$$

$$y = 4(\text{m})x + b$$

$$= 4\left(\frac{1}{2}\right)x + b$$

$$= 2x + b$$

$$y = 2(0) + b$$

$$\boxed{(-4) = \quad \quad \quad b}$$

$$\therefore \boxed{y = 2(x) - 4}$$

$$\therefore g(9)$$

$$= 2(9) - 4$$

$$= 18 - 4$$

$$\boxed{= 14}$$

ANSWER,

$$x^2 + 20x + y^2 + 16y = -20$$

$$(x + 10)^2 + (y + 8)^2 =$$

Page 60, ~~Q 29~~ Q 30

PARABOLA.

FIVE STAR.

FIVE STAR.

FIVE STAR.

FIVE STAR.

4



4

Questions 37 and 38 refer to the following information.

Ms. Simon's Workday Morning Drive

Segment of drive	Distance (miles)	Average driving speed with no traffic delay (mph)
From home to freeway entrance	0.6	25
From freeway entrance to freeway exit	15.4	50
From freeway exit to workplace	1.4	35

Ms. Simon drives her car from her home to her workplace every workday morning. The table above shows the distance, in miles, and her average driving speed, in miles per hour (mph), when there is no traffic delay, for each segment of her drive.

SOLUTIONS.

37

One morning, Ms. Simon drove directly from her home to her workplace in 24 minutes. What was her average speed, in miles per hour, during her drive that morning?

$$\frac{10}{8} = \frac{x}{24}$$

43.5, 43,
44

38

If Ms. Simon starts her drive at 6:30 a.m., she can drive at her average driving speed with no traffic delay for each segment of the drive. If she starts her drive at 7:00 a.m., the travel time from the freeway entrance to the freeway exit increases by 33% due to slower traffic, but the travel time for each of the other two segments of her drive does not change. Based on the table, how many more minutes does Ms. Simon take to arrive at her workplace if she starts her drive at 7:00 a.m. than if she starts her drive at 6:30 a.m.? (Round your answer to the nearest minute.)

6

STOP

If you finish before time is called, you may check your work on this section only.
Do not turn to any other section.

4 $\xrightarrow{24 \text{ mins.}}$ KIP

SPEED = $\frac{\text{distance}}{\text{time}}$

= $\frac{0.6 + 15.4 + 1.4}{\quad}$

= $\frac{17.4 \text{ miles.}}{24 \text{ min.}}$

= $0.725 \frac{\text{miles}}{\text{min}}$

= $0.725 \times \frac{\text{miles}}{\text{min}} \times \frac{60}{60}$

= $\frac{31.5375 \text{ miles}}{\text{hr.}}$

FIVE STAR.

FIVE STAR.

FIVE STAR.

FIVE STAR.

H \longrightarrow W.P.

06:30 AM.

07:00 AM.

~~time~~ \times speed = distance.

time = $\frac{\text{distance}}{\text{speed}}$.

(A) 06:30 AM.

time₁ = $\frac{0.6 \text{ miles}}{25} \frac{\text{hr}}{\text{mile}} = 0.024 \text{ hr}$

time₂ = $\frac{15.4}{50} \frac{\text{mi}}{\text{hr}} = 0.308 \text{ hr}$

time₃ = $\frac{1.4}{35} \frac{\text{mi}}{\text{hr}} = 0.040 \text{ hr}$

0.372 HR

~~0.2232~~
min.

(B) 07:00 AM

time₂ = $\frac{15.4}{50} \times (1.33) = 0.308 \times 1.33$

= 0.40964

~~0.1~~
0.024
0.040

0.473 HR

= 28.38 min.

\therefore 6 mins longer. ANS.