Math Skills for Business –Test 5A Name: _____
Total Marks: 50
Time: 105 minutes Student Number: _____
Aids: Calculators are permitted.

SOLUTIONS

Instructions: Write full solutions in the spaces provided. If more room is required, you may write on the back of the page.

1. a) Solve: $3(x-3)-5(x+3)=x$ (3)

$3x-9-5x-15=x$

$-2x-24=x$

$-3x=24$

$x=-8$

b) Solve for x and y: (4)

$4x-3y=-5$

$3x-4y=-2$

$3\times\boxed{1}\Rightarrow 12x-9y=-15$

$4\times\boxed{2}\Rightarrow 12x-16y=-8$

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subtract, $7y=-7$

$y=-1$

substituting $y=-1$ into $\boxed{1}$

$4x-3(-1)=-5$

$4x+3=-5$

$4x=-8$

$x=-2$

$\therefore x=-2, y=-1$

c) Solve for p: (3)

$$\frac{3p-2}{5}=\frac{p+2}{3}$$

9p-6=5p+10
4p=16
p=4

2. In a certain company, people make either \$20 per hour or \$12 per hour. The ratio of those paid at the higher rate to those paid at the lower rate is 3:10.
a) If the total amount paid out each hour to all employees is \$2160, find the total number of employees in the company. (3)
Let the ratio be written as 3x:10x to allow for the scale ratio to be x.

20(3x)+12(10x)=2160
60x+120x=2160
180x=2160
x=12
The total number of employees is 3x+10x=13x
So, the total number of employees is 13(12)=156

b) The following year everyone was given a raise of \$4 per hour. Assume that nobody is promoted, hired, or released. Find the percentage increase in the total paid out each hour to all employees. Round your answer to the nearest percent. (2)

New amount per hour= \$24(36) +\$16(120)=\$2784

$$\%\ \text{increase}$$
$$=\frac{2784-2160}{2160}\times 100$$
$$=0.28888$$
$$=29\%\ \text{(rounded to the nearest percent)}$$

3. The table below represents some data concerning my investment account over time. (Calculated on Dec. 31st of each year)

2007	2008	2009	2010	2011 (projected)
$240 000	$210 000		$300 000	

a) Find the percentage decrease in my investment account from 2007 to 2008 (answer as a percent, to one decimal place) (2)

$$\%\ \text{change} = \frac{210000 - 240000}{240000}$$
$$= -12.5$$

the decrease was 12.5%

b) My account is projected to increase by 12% from 2009 to 2010. What was my current amount at the end of 2009? (Rounded to the nearest cent) (2)

$$x(1.12) = 300000$$
$$x = \frac{300000}{1.12} = 267857.14$$

c) The amount projected to be in the account at the end of 2011 was based a prediction of an average increase of 7% compounded annually, based on my account at the end of 2007. Find the amount projected for the end of 2011. (round to the nearest cent) (2)

$$240000(1.07)^4 = \$31451.04$$

4. The relationship between amount of money spent on advertising (\$***x***) and resulting total revenue (\$***y***) is assumed to be linear. That is, it can be expressed in the form y=mx+b. The chart below provides some information.

x	***y***
$10 000	$20 000
$12 500	$24 000

a) Use this information to predict the equation in the form *y=mx + b* (3)

$$m = \frac{4000}{2500} = 1.6 \text{ or } \frac{8}{5}$$
$$y = 1.6x + b$$
$$20000 = 1.6(10000) + b$$
$$b = 4000$$
$$y = 1.6x + 4000$$
or
$$y = \frac{8}{5}x + 4000$$

b) Assuming the company does not advertise, what does the formula predict for total revenue? (1)

Let y=0
So, $4000 total revenue

c) It turns out that this model fails once the revenue reaches $400 000. Find the maximum amount that is spent on advertising (before the model fails). (2)

400000=1.6x+4000
396000=1.6x
x=$247 500 on advertising for 400 000 total revenue

5. a) I manage an account initially valued at $80 000 on my own (no fees) and I end up with $100 000 at the end of a three-year period. Find the percentage increase, compounded annually, made on the account with me managing it.
(Answer as a percent, rounded to one decimal place) (3)

$100000 = 80000(1+i)^3$

$1.25 = (1+i)^3$

$i = 1.25^{1/3} - 1 = 0.0772$

$Interest$ of 7.7% to one decimal place

b) My friend invests some money with an advisor, who charges a fixed amount of $3 000 per year to manage the account. If his account is valued initially at $80 000 and it is assumed that its value increases by 10% compound interest per year **before** the $3000 amount is deducted each year. Determine the value of my friend's account at the end of a three-year period. (3)

$Year 1:$

$80000(1.1) - 3000 = \$85000$

$Year 2$

$85000(1.1) - 3000 = \$90500$

$Year 3$

$90500(1.1) - 3000 = \$96550$

He has $96550 at the end of the three year period

6. The value of the Canadian dollar, in U.S funds, is valued today at $0.97 today. The Canadian dollar is predicted to increase in value by 15% simple interest this year against the U.S. dollar. After how many days does this model predict it will be worth the same as a U.S. dollar? (answer to the nearest day) (3)

Needs to gain 3 cents. So,

$I = \Pr t$

$0.03 = 0.97(0.15)(t)$

$t \text{ (in years)} = \dfrac{0.03}{0.97(0.15)}$

$t \text{ (in days)} = \dfrac{0.03}{0.97(0.15)} \times 365 = 75.26$

Or 75 days to the nearest day (accept 76 days)

7. There are two fares for transit users. One is for seniors/students and the second is the regular adult fare. A family with two adults and three students costs $10.85. A group consisting of one adult and four seniors costs $9.80. Find the cost of a regular adult transit fare. (5)

Let x be the adult fare and let y be the senior/student fare.

$2x + 3y = 10.85$

$x + 4y = 9.80$

$x = 9.8 - 4y$

$Substituting\ x = 9.8 - 4y$

$2(9.8 - 4y) + 3y = 10.85$

$19.6 - 5y = 10.85$

$5y = 8.75$

$y = 1.75$

$x = 9.8 - 4(1.75)$

$x = 2.8$

The adult fare is $2.80

(of course this can also be done by elimination)

8. The formula used to calculate the *annual increase (y)* in the website sales of an internet company is given by the formula $y = 10\sqrt{x}$ where x represents the current website sales at the beginning of the year.

a) Find the annual increase in sales if the current website sales are $22 500. (1)

$y = 10\sqrt{22500}$

$y = 1500$

The increase is $1500

b) Find the percentage increase in the website sales (round percent to one decimal) (2)

$$\%increase = \frac{1500}{22500} \times 100 = 6.7\% \text{ (to one decimal place- accept 6.67\%)}$$

c) Projecting the increase for the following year, will the percentage increase be greater in year 1 or year 2? (Simply state your answer as 1 or 2) (2)

New current website sales $= x = 22500 + 1500 = 24000$

$$y = 10\sqrt{24000} = 1549.19$$

$But,$

$$\%increase = \frac{1549.19}{24000} \times 100 = 6.5\%$$

So the answer is YEAR 1

9. A game of cards is played with 5 cards. Three of these cards has the number 10 written on one side only. The other two cards are blank on both sides. Cards are initially number side face down. Two cards are randomly selected and turned over.

Find:

a) the probability that when both cards turned over both show the number 10. (2)

$$P(both \text{ show a } 10) = \left(\frac{3}{5}\right)\left(\frac{2}{4}\right) = 30\%$$

b) the probability that when both cards are turned over exactly one of the two will still be blank. (2)

$$P(exactly\ one \text{ is blank}) = P(B,10) + P(10,B) \qquad \text{or just } 2 \times P(B,10)$$

$$= \left(\frac{2}{5}\right)\left(\frac{3}{4}\right) + \left(\frac{3}{5}\right)\left(\frac{2}{4}\right) = 60\%$$