**Math 10 Rad Rads and Cool Cubes**

**Multiple Choice**

*Identify the choice that best completes the statement or answers the question.*

**\_\_\_\_ 1.** Evaluate 0.14.

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** | 0.4 | **c.** | 0.001 |
| **b.** | 0.01 | **d.** | 0.0001 |

**\_\_\_\_ 2.** What is the volume of a cube with edges of length 9 m?

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** | 2187 m3 | **c.** | 81 m3 |
| **b.** | 486 m3 | **d.** | 729 m3 |

**\_\_\_\_ 3.** What is ?

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** |  | **c.** |  |
| **b.** |  | **d.** |  |

**\_\_\_\_ 4.** Simplify .

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** |  | **c.** | 16 |
| **b.** |  | **d.** | 144 |

**\_\_\_\_ 5.** Express [(–8)8]5 as a power with a single exponent.

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** | (–8)40 | **c.** | (–8)3 |
| **b.** | (–8)13 | **d.** | (–64)5 |

**\_\_\_\_ 6.** Which expression represents the volume of a cube of edge length 5*x*?

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** | (5*x*)(5*x*)(5*x*) | **c.** | 6(5*x*)2 |
| **b.** | 5*x* + 5*x* + 5*x* | **d.** | 125*x*2 |

**\_\_\_\_ 7.** What is the next number in the sequence 33, 32, 31, 30, …?

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** | –1 | **c.** |  |
| **b.** | 3–2 | **d.** | 1 |

**\_\_\_\_ 8.** Evaluate 24 + 2–4.

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** |  | **c.** | 0 |
| **b.** |  | **d.** | 16 |

**\_\_\_\_ 9.** What is the value of ?

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** |  | **c.** |  |
| **b.** |  | **d.** |  |

**\_\_\_\_ 10.** Eric deposits $0.01 into a bank account that doubles the amount of money in the account every year. After 1 year the value of the account is $0.02, and after 2 years it is $0.04. What will the value of the account be after 12 years?

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** | $0.24 | **c.** | $81.92 |
| **b.** | $40.96 | **d.** | $167 772.16 |

**\_\_\_\_ 11.** Express  as an equivalent mixed radical.

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** |  | **c.** |  |
| **b.** |  | **d.** |  |

**\_\_\_\_ 12.** Which expression has the smallest value?

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** |  | **c.** |  |
| **b.** |  | **d.** |  |

**\_\_\_\_ 13.** Which of the following is equivalent to ?

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** |  | **c.** |  |
| **b.** |  | **d.** |  |

**\_\_\_\_ 14.** What is  as an equivalent radical?

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** |  | **c.** |  |
| **b.** |  | **d.** |  |

**\_\_\_\_ 15.** Write ****as a power with a single positive exponent.

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** |  | **c.** |  |
| **b.** |  | **d.** |  |

**Matching**

*Match the correct term to each of the following descriptions. A term may be used more than once or not at all.*

|  |  |  |  |
| --- | --- | --- | --- |
| **a.** | radicand | **d.** | irrational number |
| **b.** | radical | **e.** | index |
| **c.** | mixed radical | **f.** | entire radical |

**\_\_\_\_ 1.** a number that cannot be expressed as a terminating or repeating decimal

**\_\_\_\_ 2.** the number 3 in the expression 

**\_\_\_\_ 3.** the product of 1 and a radical

**\_\_\_\_ 4.** the product of a rational number and a radical

**\_\_\_\_ 5.** consists of a root symbol, an index, and a radicand

**Short Answer**

1. Evaluate  using prime factorization.(2)

**2.** Simplify .(2)

**3.** Simplify each expression. Write the answer using positive exponents. Do not evaluate.(2 each)

**a)** 

**c)** 

**4.** Simplify, then evaluate. Express the answer to four decimal places, where necessary.(2 each)

**a)** ****

**b) **

**5.** Order the following numbers from greatest to least. (1)

, , , 

**6.** Express each entire radical as a mixed radical in simplest form. (1 each)

**a) **

**b) **

**c) **

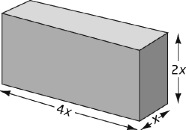
**7.** Express each radical as a power.(1 each)

**a) **

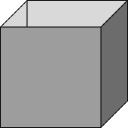
**c) **

**Problem: Solve 1 or 2, solve 3, solve 4 or 5 and solve 6.**

**1.** What is the edge length of the cube that has the same volume as this rectangular prism? Explain your reasoning.(3)



**2.** An open-topped cubical box has a volume of 216 cm3. Determine the total surface area of the five faces of the box.(3)



**3.** The first five numbers in a pattern are 1, 2, 9, 64, and 625.

**a)** Describe the pattern. Show how the first five terms were calculated.(2)

**b)** Using a calculator, determine the next three terms.(1)

**c)** Determine the tenth term.(1)

**d)** Write an expression for the *n*th term in the pattern.(1)

**4.** A company manufactures fences for residential use. The production of fencing can be modelled using the equation *s* = , where *s* is the number of sections of fencing produced and *h* is the number of hours of labour.

**a)** How many sections will be produced if a crew works a total of 120 h in a day?(1)

**b)** How many more sections will be produced in 240 h per day?(1)

**c)** How many hours of labour will be needed if the company wants to maintain a production rate of 49 sections per day?(1)

**5.** The amount of time that a particular drug remains in the human bloodstream is given by the equation , where

• *M* is the mass of drug remaining in the bloodstream, in milligrams,

• *M*0 is the mass of the dose administered, in milligrams, and

• *h* is the time, in hours, since the dose was given.

If 240 mg is administered, how much of the drug will remain in the bloodstream after 3 h, 6h and 12 hours? Express the answer to one decimal place.(3)

**6.** The height and the base of a triangle each measure  units. What is the area of the triangle?(2)

**Math 10 Rad Rads and Cool Cubes**

**Answer Section**

**MULTIPLE CHOICE**

**1.** ANS: D PTS: 1 DIF: A OBJ: Section 4.2

NAT: AN3 TOP: Integral Exponents KEY: integral exponent | power

**2.** ANS: D PTS: 1 DIF: A OBJ: Section 4.1

NAT: AN1 TOP: Square Roots and Cube Roots KEY: volume | perfect cube

**3.** ANS: D PTS: 1 DIF: A OBJ: Section 4.2

NAT: AN3 TOP: Integral Exponents

KEY: integral exponent | order of operations

**4.** ANS: A PTS: 1 DIF: B OBJ: Section 4.2

NAT: AN3 TOP: Integral Exponents

KEY: integral exponent | order of operations

**5.** ANS: A PTS: 1 DIF: B OBJ: Section 4.2

NAT: AN3 TOP: Integral Exponents KEY: exponent laws | power of a power

**6.** ANS: A PTS: 1 DIF: B OBJ: Section 4.1

NAT: AN1 TOP: Square Roots and Cube Roots KEY: perfect cube | cube root | volume

**7.** ANS: C PTS: 1 DIF: B OBJ: Section 4.2

NAT: AN3 TOP: Integral Exponents

KEY: exponent laws | zero exponent | negative exponent

**8.** ANS: B PTS: 1 DIF: B OBJ: Section 4.2

NAT: AN3 TOP: Integral Exponents

KEY: exponent laws | zero exponent | negative exponent

**9.** ANS: D PTS: 1 DIF: B OBJ: Section 4.3

NAT: AN3 TOP: Rational Exponents

KEY: rational exponent | exponent laws | power of a quotient

**10.** ANS: B PTS: 1 DIF: C OBJ: Section 4.2

NAT: AN3 TOP: Integral Exponents KEY: apply powers | growth

**11.** ANS: D PTS: 1 DIF: C OBJ: Section 4.4

NAT: AN2 TOP: Irrational Numbers KEY: convert entire radical

**12.** ANS: B PTS: 1 DIF: B OBJ: Section 4.3

NAT: AN3 TOP: Rational Exponents KEY: rational exponent

**13.** ANS: B PTS: 1 DIF: C OBJ: Section 3.3 | Section 4.4

NAT: AN3 TOP: Rational Exponents | Irrational Numbers

KEY: negative exponent | convert radical to power

**14.** ANS: A PTS: 1 DIF: A OBJ: Section 4.4

NAT: AN2 TOP: Irrational Numbers KEY: convert power to radical

**15.** ANS: B PTS: 1 DIF: B OBJ: Section 4.3

NAT: AN3 TOP: Rational Exponents KEY: exponent laws | power of a product

**MATCHING**

**1.** ANS: D PTS: 1 DIF: A OBJ: Section 4.4

NAT: AN2 TOP: Irrational Numbers KEY: irrational number

**2.** ANS: E PTS: 1 DIF: A OBJ: Section 4.4

NAT: AN2 TOP: Irrational Numbers KEY: index

**3.** ANS: F PTS: 1 DIF: A OBJ: Section 4.4

NAT: AN2 TOP: Irrational Numbers KEY: entire radical

**4.** ANS: C PTS: 1 DIF: A OBJ: Section 4.4

NAT: AN2 TOP: Irrational Numbers KEY: mixed radical

**5.** ANS: B PTS: 1 DIF: A OBJ: Section 4.4

NAT: AN2 TOP: Irrational Numbers KEY: radical

**SHORT ANSWER**

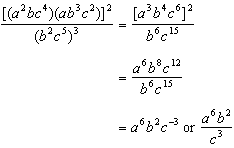
**1.** ANS:



PTS: 1 DIF: B OBJ: Section 4.1 NAT: AN1

TOP: Square Roots and Cube Roots KEY: prime factorization

**2.** ANS:



PTS: 1 DIF: C OBJ: Section 4.2 NAT: AN3

TOP: Integral Exponents

KEY: exponent laws | product of powers | power of a power | quotient of powers

**3.** ANS:

**a)** (–2.5)5

**c)** 

PTS: 1 DIF: B OBJ: Section 4.2 | Section 4.3

NAT: AN3 TOP: Integral Exponents | Rational Exponents

KEY: exponent laws | product of powers | quotient of powers | negative exponent

**4.** ANS:

**a)** 

**b) **

PTS: 1 DIF: B OBJ: Section 4.2 NAT: AN3

TOP: Integral Exponents

KEY: exponent laws | quotient of powers | power of a power | negative exponent

**5.** ANS:

, , , 

Convert each mixed radical to an entire radical.

The entire radicals are , , , .

PTS: 1 DIF: B OBJ: Section 4.4 NAT: AN2

TOP: Irrational Numbers KEY: order irrational numbers | convert mixed radical

**6.** ANS:

**a) **

**b) **

**c) **

PTS: 1 DIF: A OBJ: Section 4.4 NAT: AN2

TOP: Irrational Numbers KEY: convert entire radical

**7.** ANS:

**a) **

**c) **

PTS: 1 DIF: B OBJ: Section 4.4 NAT: AN3

TOP: Irrational Numbers KEY: convert radical to power

**PROBLEM**

**1.** ANS:

• The volume of the rectangular prism is (*x*)(2*x*)(4*x*) = 8*x*3.

• The length, width, and height of a cube are equal.

• Therefore, the edge length of the cube, when cubed, must equal 8*x*3. The edge length of the cube is  or 2*x*.

PTS: 1 DIF: C OBJ: Section 4.1 NAT: AN1

TOP: Square Roots and Cube Roots KEY: volume | cube root

**2.** ANS:

Find the side length, *s*, of the square faces of the box.

|  |  |
| --- | --- |
| *s* | = |
|  | = 6 |

Each face is 6 cm by 6 cm and has an area of 36 cm2.

(5)(36) = 180

The surface area of the five faces of the box is 45 cm2.

PTS: 1 DIF: B OBJ: Section 4.1 NAT: AN1

TOP: Square Roots and Cube Roots KEY: area | volume | cube root

**3.** ANS:

**a)** The pattern is consecutive numbers for the base and 1 less than the base for the corresponding exponent. The 1st term can be represented as 10, the 2nd as 21, the 3rd as 32, the 4th as 43, and the 5th as 54.

**b)** 6th term = 65 = 7776; 7th term = 76 = 117 649; 8th term = 87 = 2 097 152

**c)** 109 = 1 000 000 000

**d)** *nn* – 1

PTS: 1 DIF: B OBJ: Section 4.2 NAT: AN3

TOP: Integral Exponents KEY: compare powers | patterns

**4.** ANS:

**a)** Substitute *h* = 120:



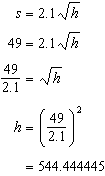
About 23 sections of fencing will be produced in 120 h of labour.

**b)** Substitute *h* = 240:



The company will produce 33 sections using 240 h of labour. This represents an additional 10 sections.

**c)** Substitute *s* = 49.

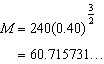


About 544 h of labour per day will be needed to produce 49 sections of fencing daily.

PTS: 1 DIF: C OBJ: Section 4.4 NAT: AN2 | AN3

TOP: Irrational Numbers KEY: irrational number | apply radicals

**5.** ANS:

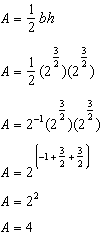
****

Approximately 60.7 mg of the drug will remain in the bloodstream after 3 h.

PTS: 1 DIF: D OBJ: Section 4.3 NAT: AN3

TOP: Rational Exponents KEY: apply powers | decay

**6.** ANS:



The area of the triangle is 4 square units.

PTS: 1 DIF: B OBJ: Section 4.3 NAT: AN3

TOP: Rational Exponents

KEY: area | exponent laws | product of powers | negative exponents